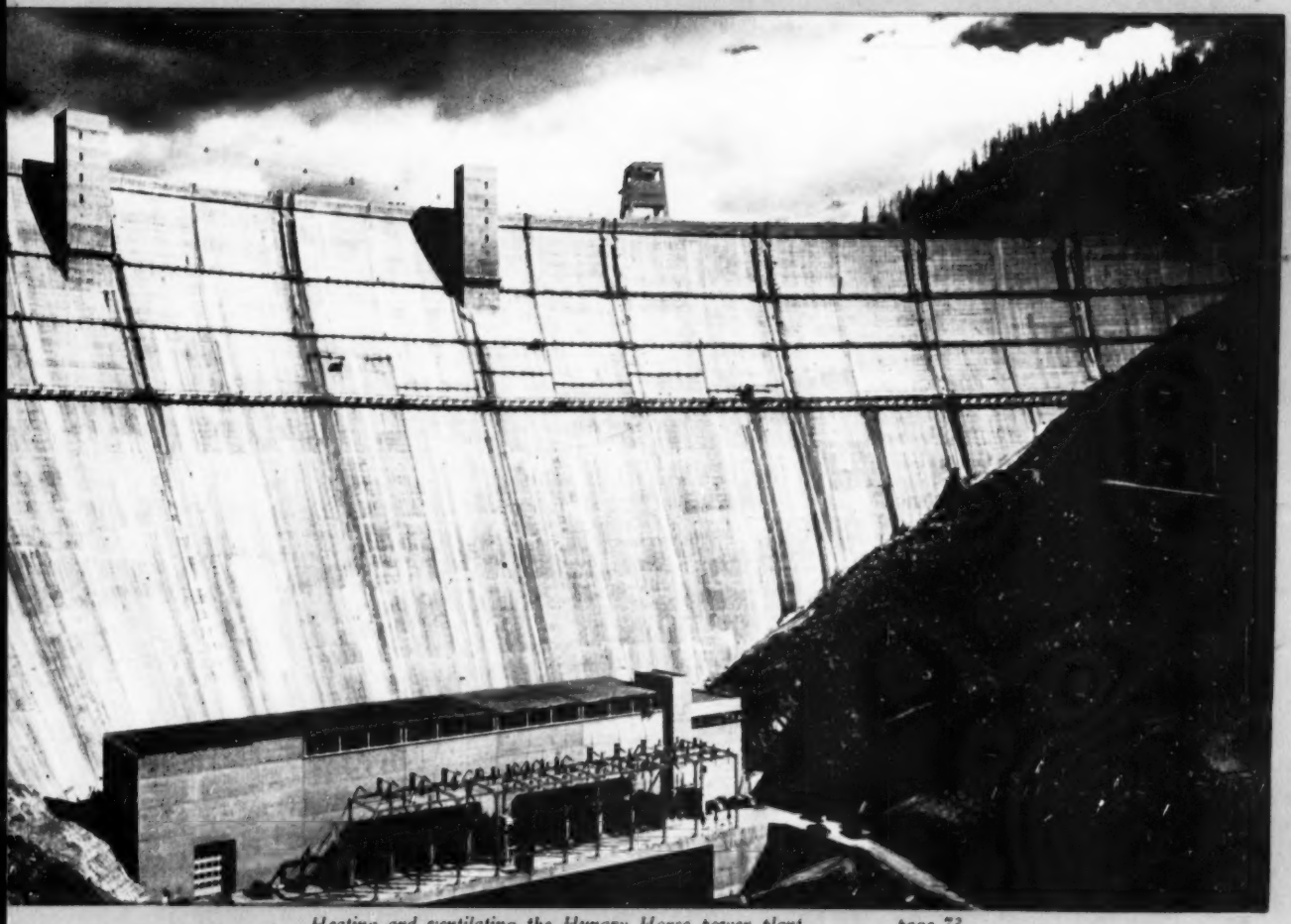
Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

AUGUST ★ 1953

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

Page 109—Journal Section of The American Society of Heating and Ventilating Engineers



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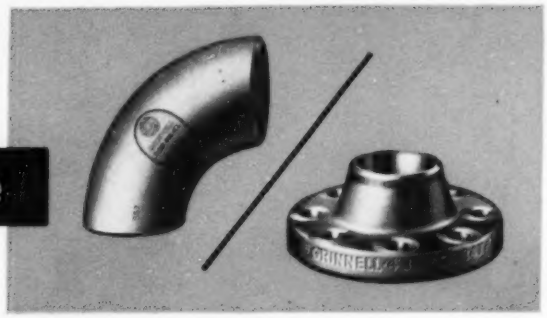
for trouble-free service



GRINNELL

STAINLESS STEEL WELDING FITTINGS and FLANGES

To help combat mounting costs in the installation and maintenance of piping systems where corrosive or certain other service conditions are involved, Grinnell offers a comprehensive range of welding fittings and flanges in stainless steel.

- **To prevent corrosive attack.**
- **To obtain adequate impact resistance at low temperatures and sufficient creep strength at high temperatures.**
- **To provide sanitary conditions.**
- **To avoid contaminating the product.**

Grinnell welding fittings and flanges are available in types 304, 347 and 316. These are in the chromium-nickel grades known as "18-8". The corrosion resistant properties of stainless steels are primarily due to the chromium content which ranges from 17% to 20%. The addition of nickel in ranges from 7% to 14% improves the corrosion resistance as well as the properties at elevated temperatures. A molybdenum addition of 2% to 3%, as found in type 316, increases the resistance to sulphurous and phosphoric acids, brine and hypochlorite solutions, and improves the general resistance to other corrosive liquids, as well as improving the physical properties at elevated temperatures. A columbium addition of approximately 0.4% to 1.0%, as found in type 347, creates non-susceptibility to carbide precipitation which can cause intergranular corrosion.

In addition to stainless steel, Grinnell offers welding fittings and flanges in carbon steel, nickel, Inconel, Monel, aluminum and brass.

Write for new booklet giving complete data on Grinnell stainless steel welding fittings and flanges. No obligation.

stainless steel welding fittings
Types 304, 347, 316

DESCRIPTION	SCHEDULE†	PIPE SIZE, IN.‡
90° Long Radius Elbow 45° Long Radius Elbow 180° Long Radius Return Straight Tee	5s, 10s, 40s, 80s	½ to 12
Reducing Tee	5s, 10s, 40s, 80s	¾ to 12
Cross (Straight and Reducing)	5s, 10s, 40s, 80s	1¼ to 12
Concentric Reducer Eccentric Reducer	5s, 10s, 40s, 80s	¾ to 12
Lateral (Straight or Reducing)	5s, 10s, 40s, 80s	1 to 12
Cap	5s, 10s, 40s, 80s	½ to 12
Lap Joint Stub End-Long	10s, 40s, 80s	½ to 12
Lap Joint Stub End-Short	5s, 10s, 40s,	½ to 12

† 5s is Featherweight, 10s Lightweight, 40s Standard, 80s Extra Strong.
‡ Larger sizes available on special order.

stainless steel flanges

150 lb. and 300 lb. Steel Flange Standard *(Higher series available on application).*

DESCRIPTION	PIPE SIZE, IN.
Welding Neck Slip-on Lap Joint Threaded Socket Type Blind	½ to 24

150 lb. Corrosion Resistant Standard. *(For use with schedule 10s and 5s pipe. Rated at 150 psi at 500°F, 225 psi at 150°F, when used with full-faced gaskets).*

DESCRIPTION	PIPE SIZE, IN.
Buttwelding Slip-on Blind	½ to 12

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

5 basic standard components make

usAIRco
BLOWER TYPE
HEATING AND VENTILATING UNITS

adaptable to every need!

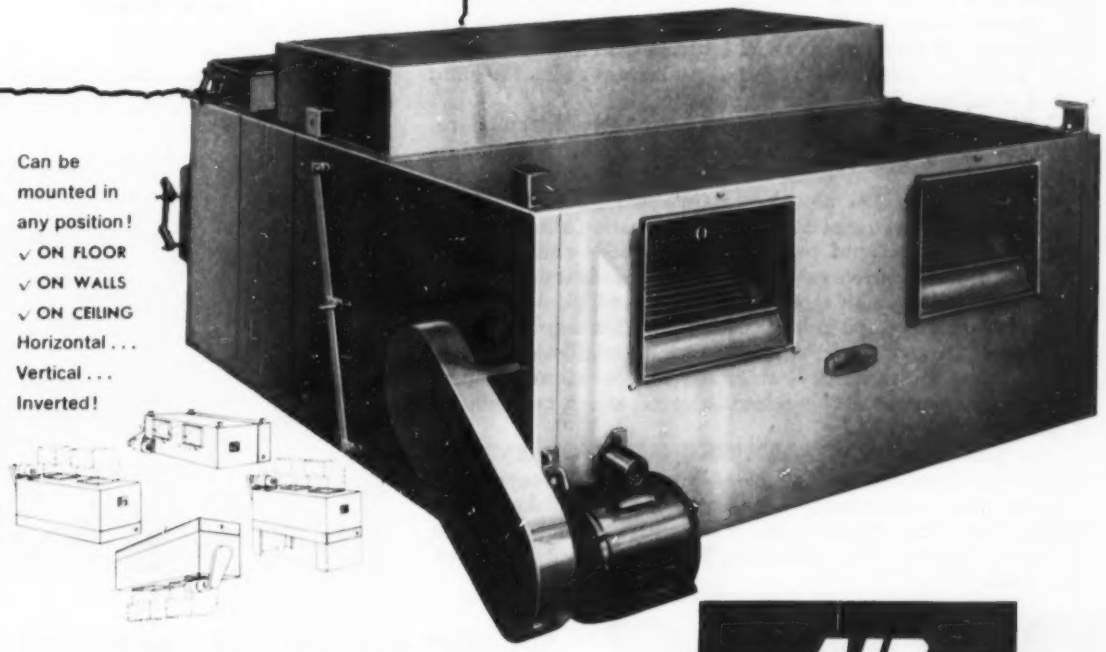
AVAILABLE IN 8 SIZES FOR USE IN LARGE AREAS WHERE UNIFORM HEATING IS REQUIRED

1200 to 32,000 C.F.M.
37,000 to 2,000,000 BTU

Co-ordinated construction of usAIRco Blower Type Units makes possible an unlimited number of arrangements. Because of this exceptionally wide variety of arrangements, the unit can do one or any number of the following: heat, ventilate, mix and filter air, with or without ductwork.

usAIRco BH Units are factory fabricated and can be specified with any combination of the following standard sections: blower, coils, face and by-pass damper, filter and mixing chamber.

Co-ordinated construction also means easy installation and trouble-free maintenance because each section is readily accessible for inspection. For unit heater application, outlet cowls and leg base are provided.



Can be mounted in any position!
√ ON FLOOR
√ ON WALLS
√ ON CEILING
Horizontal . . .
Vertical . . .
Inverted!

for descriptive literature on BH Units write Dept. HP 853

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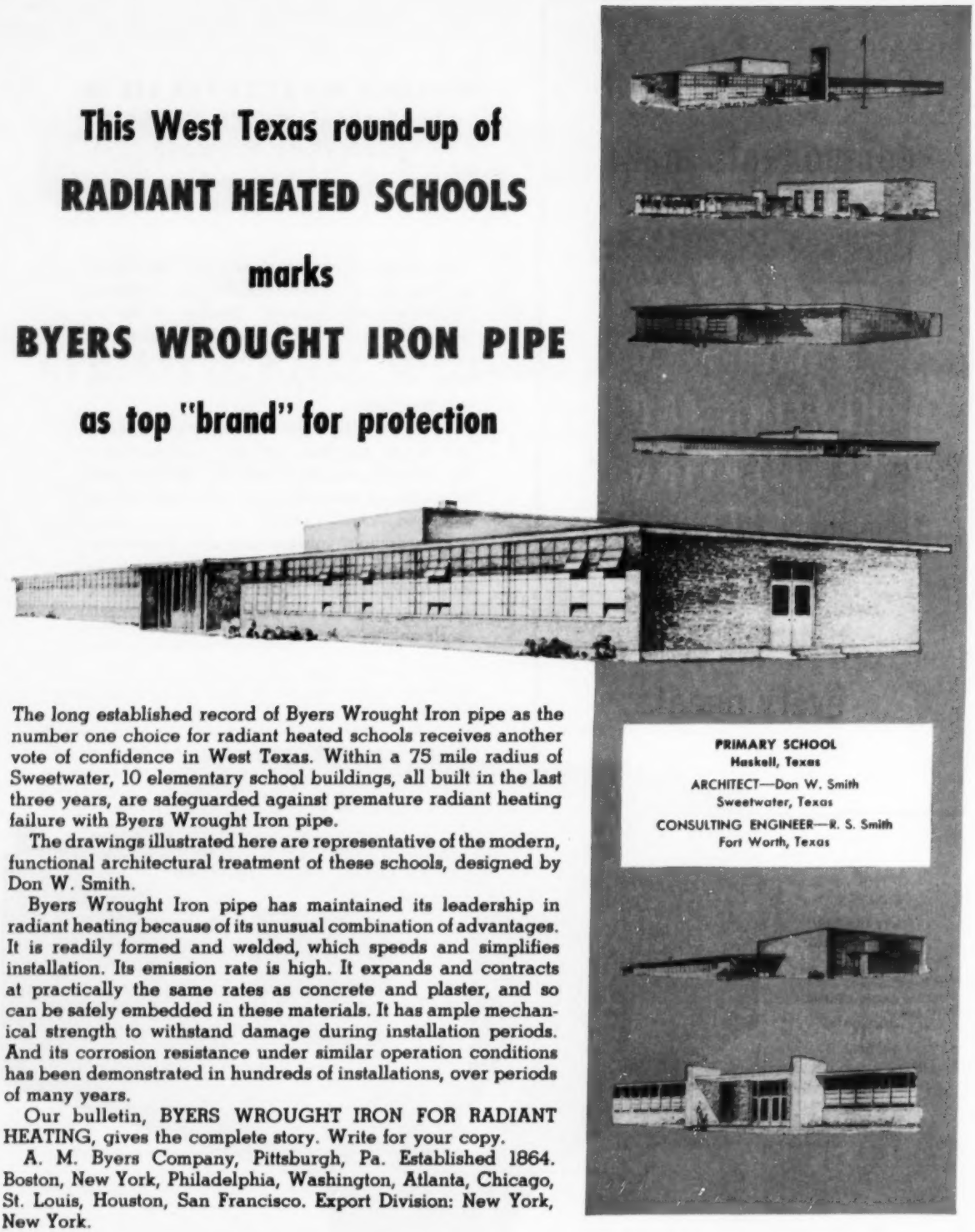
MINNEAPOLIS 14, MINNESOTA

usAIRco
30 YEARS OF AIR CONDITIONING

This West Texas round-up of RADIANT HEATED SCHOOLS marks BYERS WROUGHT IRON PIPE as top "brand" for protection



PRIMARY SCHOOL
Haskell, Texas
ARCHITECT—Don W. Smith
Sweetwater, Texas
CONSULTING ENGINEER—R. S. Smith
Fort Worth, Texas

The long established record of Byers Wrought Iron pipe as the number one choice for radiant heated schools receives another vote of confidence in West Texas. Within a 75 mile radius of Sweetwater, 10 elementary school buildings, all built in the last three years, are safeguarded against premature radiant heating failure with Byers Wrought Iron pipe.

The drawings illustrated here are representative of the modern, functional architectural treatment of these schools, designed by Don W. Smith.

Byers Wrought Iron pipe has maintained its leadership in radiant heating because of its unusual combination of advantages. It is readily formed and welded, which speeds and simplifies installation. Its emission rate is high. It expands and contracts at practically the same rates as concrete and plaster, and so can be safely embedded in these materials. It has ample mechanical strength to withstand damage during installation periods. And its corrosion resistance under similar operation conditions has been demonstrated in hundreds of installations, over periods of many years.

Our bulletin, BYERS WROUGHT IRON FOR RADIANT HEATING, gives the complete story. Write for your copy.

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WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 25 No. 8

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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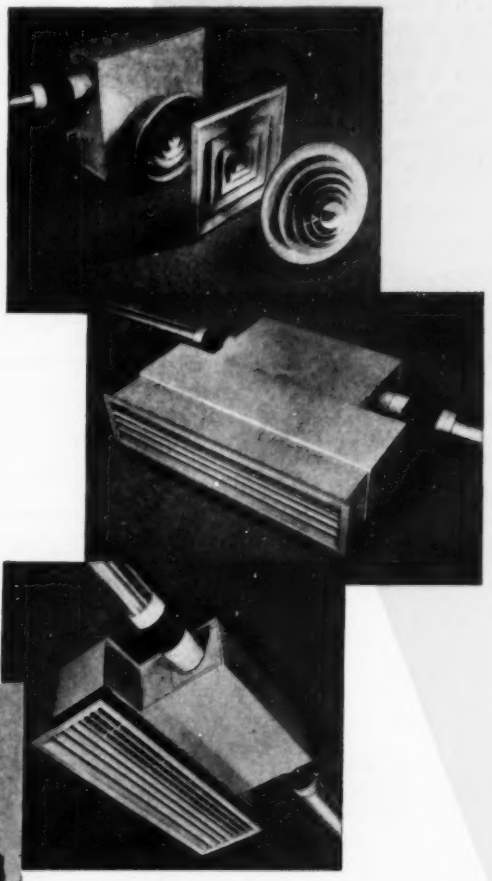
Pick your package

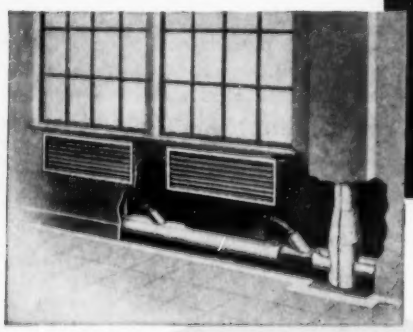
ANEMOSTAT HIGH VELOCITY ASPIRATING UNITS

Here's Anemostat's answer to the problem of high velocity air distribution.

Each of these easy-to-install packaged units consists of a combination static pressure and velocity reducing valve, plus sound attenuating chamber and one of several types of Anemostat draftless air diffusers. A wide choice to meet all your engineering and architectural requirements.

For top flight performance in high velocity air distribution systems, pick your package from Anemostat's line of tried and proven high velocity units. Write for High Velocity Manual No. 48 for details.





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DRAFTLESS *Aspirating* AIR DIFFUSERS

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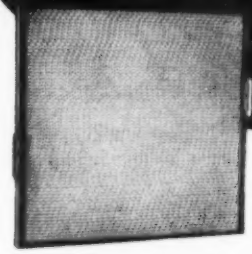

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Gentlemen: I would like full information on FAR-AIR filters.
I would ____ would not ____ like a Farr Field Engineer to call.

1+1=3 LOWER FIRST COST

FAR-AIR filters handle 50% more air per unit with less pressure loss than ordinary types. Thus two filters will do the work of three which means fewer units to buy originally plus the economy of smaller plenum chambers. Each FAR-AIR filter will handle *more* dirt and *more* air with *less* pressure loss and will give greater efficiency than other types of impingement filters.

60% LESS MAINTENANCE

Because there are fewer filters required to do your job and because of the exclusive herringbone-crimp media design which allows each filter to hold more dirt, cleaning frequency is drastically reduced—over 50%! Maintenance is faster and easier, too, because of the free flushing characteristics of the media – a great saving in time and money.

GREATER EFFICIENCY

The exclusive herringbone-crimp design of FAR-AIR filters allows the dirt to load progressively through the entire filter, not just on the face. There is exceptionally low pressure loss even on a fully loaded filter because channels in the media allow passage of clean air. This gives you more efficient filtering under all dust conditions for longer periods of time.

LONGER SERVICE LIFE

Excellence of construction protects your investment and insures that FAR-AIR filters will far outlast ordinary types. Here are some of the quality features.

Sixteen gage steel filter and holding frames assure well-aligned rigid filter banks. Reinforcing rods make distortion virtually impossible. Felt linings prevent air by-pass. Firmly packed media provides *permanent* even density and assures uniformly high efficiency over the entire filter area.

Truly, when you buy FAR-AIR filters you get more for your money *four* ways. It will pay you to investigate these filters now and cut your air filtration costs.

FAR-AIR FILTERS
"Better by Farr"
*Trade Mark

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Manufacturing Engineers
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Allis-Chalmers application engineering help plus coordinated design of Allis-Chalmers motors, control and *Texrope* V-belt drives saves you engineering and installation expense and time . . . assures a trouble-free job.

AIR CONDITIONING CONTRACTORS LIKE Allis-Chalmers complete drives because they can save money and still assure the customer of a top quality job without service problems. Allis-Chalmers District Office representatives understand the problems of air conditioning contractors and offer them help in engineering exactly the right drive for the application. Since all parts of the Allis-Chalmers drive are of coordinated design and manufacture, they match up and fit together quickly and easily. And buying from a single source is less trouble . . . means that all components arrive on the job together, ready to be installed.

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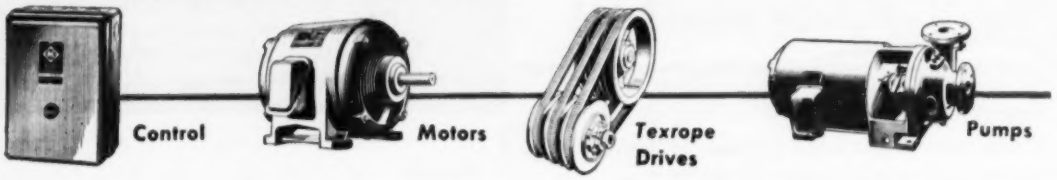
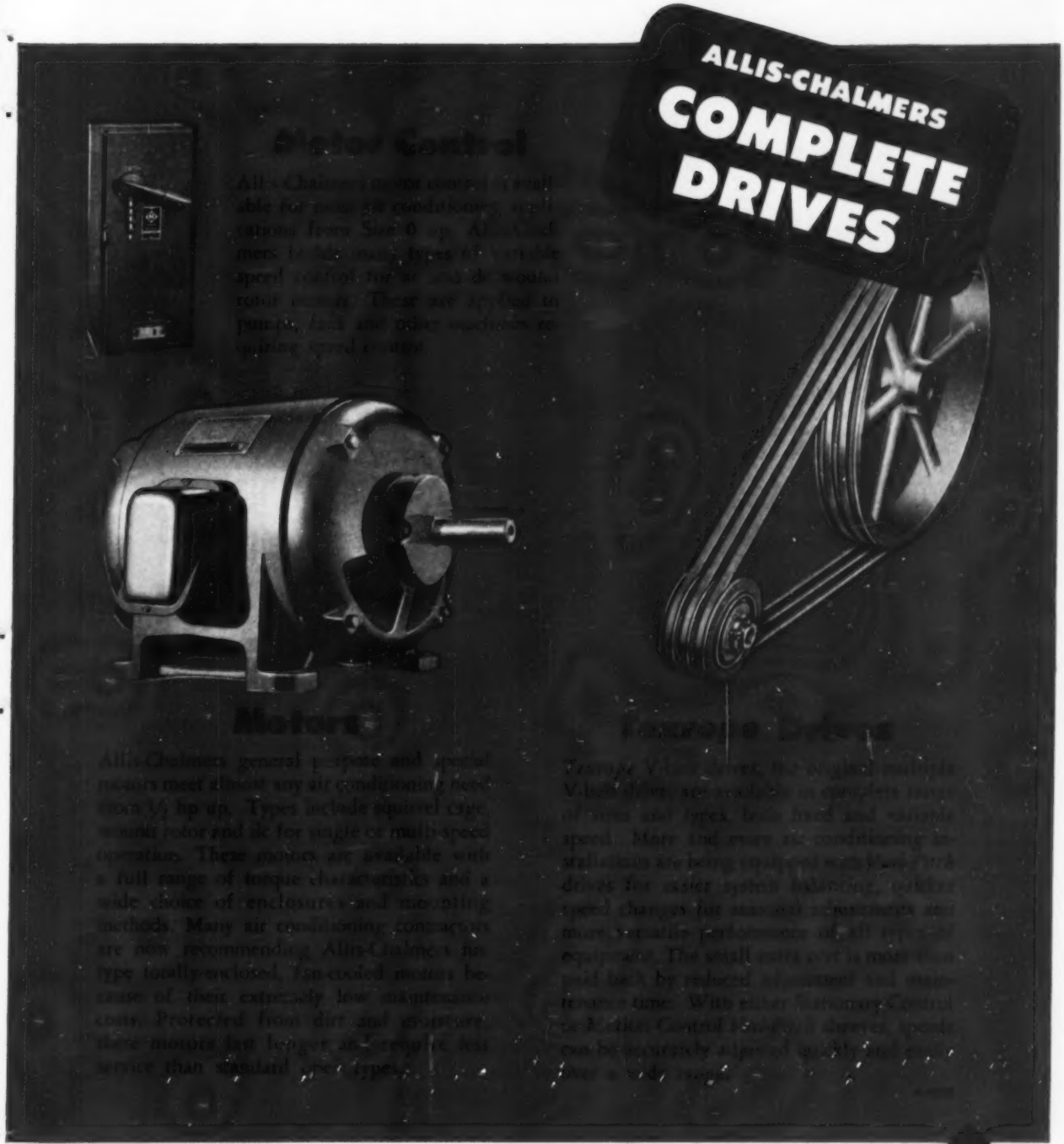


Drive Problems



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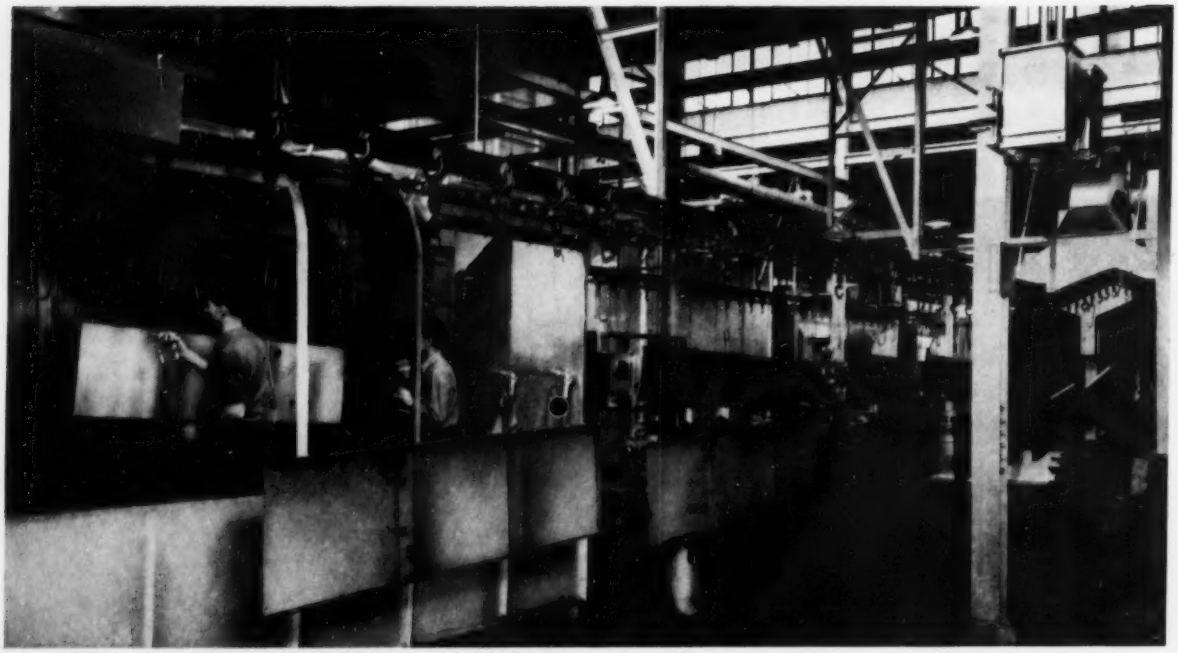


SPRAYING CORROSION-RESISTANT ENAMEL on metal panels for Worthington evaporative condensers and air conditioners. This chlorinated rubber base enamel, selected by Worthington after rigorous tests, resists chipping and long exposure to salt fog, acids, alkalis, ultra-violet light, and high and low temperatures.

FAN HOUSINGS ARE LOADED on conveyor which carries them through Worthington special 5-stage washing process. This washing, which includes sprays of Bonderite and mild chromic acid solution, prepares the equipment for the corrosion-resistant enamel.

YEARS OF TROUBLE-FREE SERVICE are assured with this Worthington evaporative condenser. The corrosion-resistant finish, rugged construction, large diameter hollow fan shaft and self-aligning ball bearings are some of the features that make this unit the finest available. You can get a Worthington evaporative condenser in any one of 18 sizes, in capacities of 10 to 150 tons.

Rustproof finish adds years to life of air conditioning equipment

For years, corrosion has presented a real problem in air conditioning and refrigeration equipment. Brine spray, water, fumes—all caused metal equipment to corrode. To combat this, Worthington engineers developed the bonderized two-coat baked chlorinated rubber enamel finish now used on all Worthington air conditioning and refrigeration units.

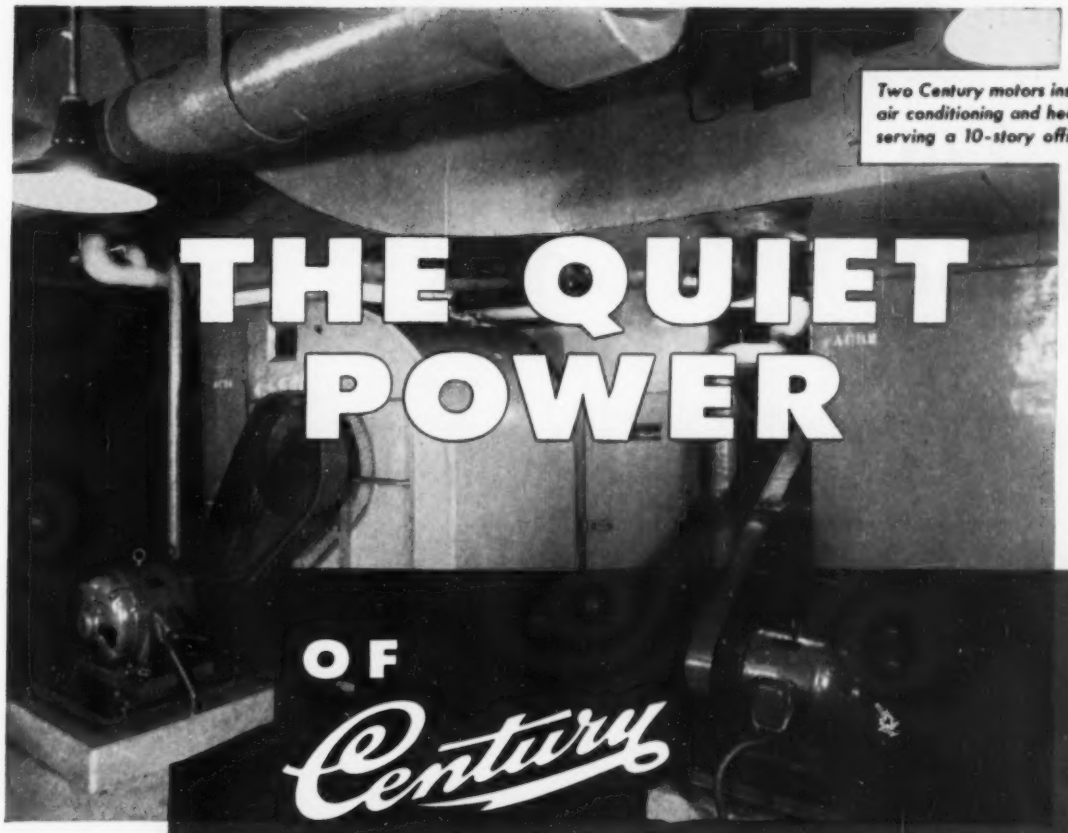
This finish, the result of years of testing and research, completely protects the metal against corrosion and preserves the original appearance of the equipment. Rigorous tests have shown that this finish will last at least three to four times longer than the best hot-dipped galvanizing coating.

Advances in construction and design like this are standard practice with Worthington, a leader in air conditioning and refrigeration for over half a century. From giant industrial refrigeration systems down to the air-conditioner for a baby's nursery, Worthington can handle any job, and provide exactly the right equipment. So when you think of air conditioning or refrigeration—think of Worthington.

For more information, get in touch with your nearest Worthington distributor. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.40, Holyoke, Mass. A.3.40

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

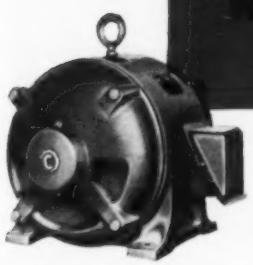


Two Century motors installed on an air conditioning and heating system serving a 10-story office building.

THE QUIET POWER OF Century MOTORS

WILL HELP KEEP YOUR CUSTOMERS HAPPY

-792



To assure quiet starting and efficient, dependable operation manufacturers do two things. They engineer their equipment skillfully *and* they choose motors carefully to bring out the best performance in their equipment.

Many leading manufacturers of heating, ventilating and air conditioning equipment depend on Century motors. They have found that Century's wide range of motor sizes and types helps them select motors that are exactly right for every job.

Century motor-power on the equipment you install is your first step toward complete customer satisfaction. Remember, Century's nationwide network of Branch Offices and Authorized Distributors is always at your service to help you with your motor problems.

400 TO 1/8 HORSEPOWER

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

a suburban shopping center
as **modern** as the

JOHNSON
AUTOMATIC TEMPERATURE
CONTROL
for its complete air conditioning system

The Village Market in LaGrange Park, Chicago's fastest growing western suburb, has been termed "truly the nation's most modern market place." The builders, Wm. Joern & Sons, realizing modern merchandisers' recognition of customer comfort as a key requirement in attracting maximum store traffic, have provided complete year 'round air conditioning in all of the 48 retail outlets, 5 of which have been set aside for professional offices which will accommodate 15 doctors and dentists.

Through summer's heat and winter's chill, temperatures are maintained throughout the entire project, at the optimum level to insure shopping comfort, by a complete system of Johnson Automatic Temperature Control. A total of 45 Johnson T-403 Master room thermostats reset Submaster Controllers on 40 separate central fan air conditioning systems to produce *just right* temperatures at all times. The 400 tons of refrigeration required for summer cooling is under the control of Johnson "Record-O-Stats" and "Pneumatic Step Controllers".

Johnson "Planned-for-the-Purpose" Control Systems are designed specifically for each individual installation. That is why you will find Johnson Control, not only in outstanding shopping centers like the Village Market, but in department stores and in every other type of public, commercial and industrial building.

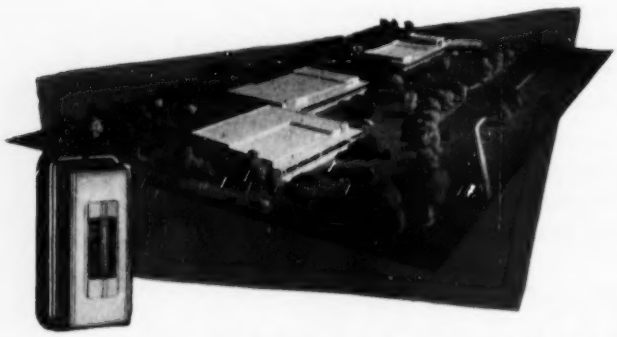
Take advantage of the experience of the Johnson nationwide organization. It is at your disposal without obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

Village Market, LaGrange Park, Illinois; Wm. Joern & Sons, general contractor and owner, LaGrange Park; Mittelbusher & Tourtelot, architects; Frank W. Riederer, mechanical engineer; Chicago Conditionaire Co., heating and air conditioning contractor, all of Chicago.

Modern medical facilities are an important part of the complete community service provided at the Village Market. Here, in the Medical Center, Johnson Control automatically assures optimum temperatures in waiting rooms, examining rooms and offices.

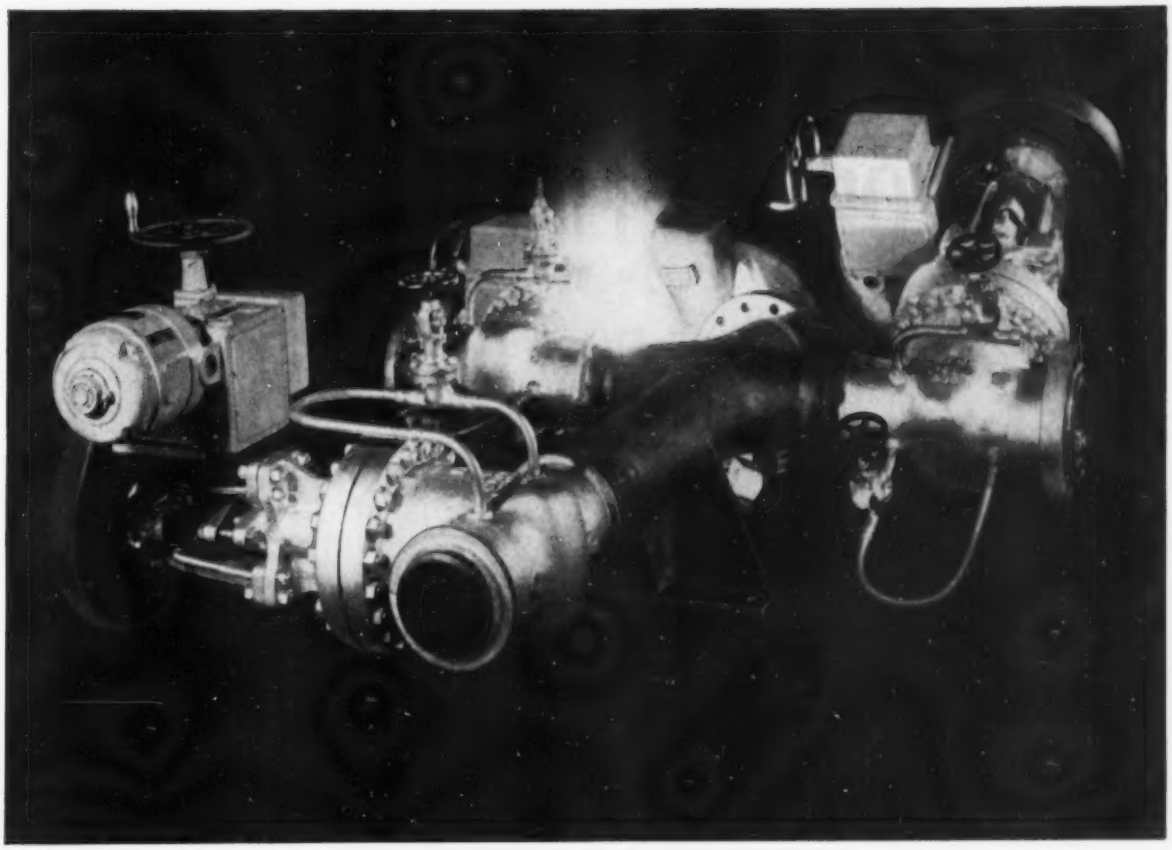
Convenient location, a diversified array of shops and services and perfect indoor weather, rain or shine, with Johnson Automatic Temperature Control! These are the ingredients that attract thousands of comfort-conscious shoppers to the Village Market.

Comfort is a "must" in the suburban branches of the larger metropolitan stores. Smart interiors and comfortable temperatures create the best possible shopping atmosphere for selling fashion apparel.



JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURE • APPLICATION • INSTALLATION • SINCE 1885



What's CRANE cooking up here?

Big Piping Savings for You—

The man behind the mask above is a *unit fabrication* specialist with a talent for saving you time, trouble—and dollars—in the long run.

He's part of a crew of experienced mechanics in one of the big Crane Fabricating Shops, where piping units like this 8-inch assembly are built *precisely* to specification.

And it's a complete as well as a quality service, for Crane takes over at the blueprint stage; supplies all valves and component parts—makes the pipe bends—does the welding. Right at hand are the best facilities for heat-treating or stress-relieving, radiography, etc., to assure uniform strength and dependability. The finished unit is pre-tested and proved in advance, ready for quick installation in your piping system.

You take no risk—you pay for no spoilages, and your erection crew is spared many a major headache. But, why not let your Crane Representative review your piping layout and help you decide where Crane Unit Fabrication will be to your advantage? There's also further information in your Crane 53 Catalog—or write for Folder AD-1771.

CRANE VALVES

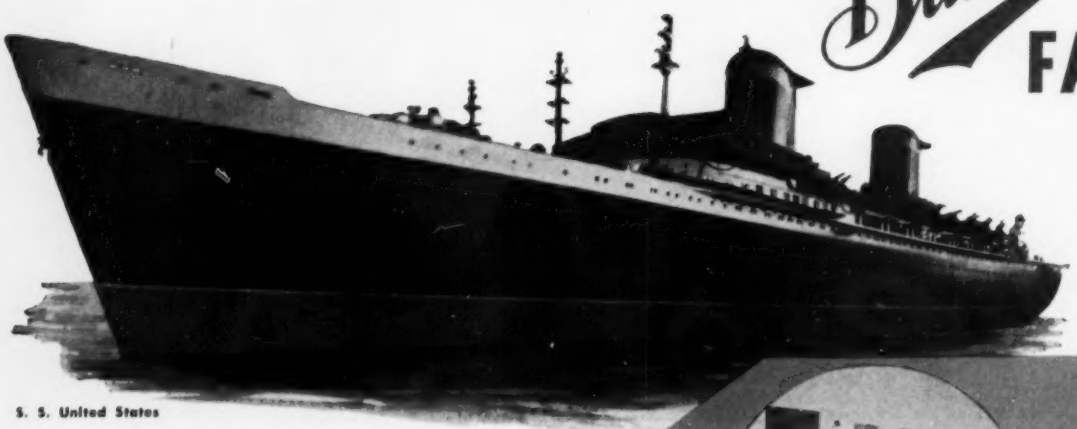
CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas

VALVES · FITTINGS · PIPE · PLUMBING · HEATING

THE WORLD'S FINEST LINER
THE WORLD'S FINEST HOTELS

USE "Buffalo" FANS



S. S. United States

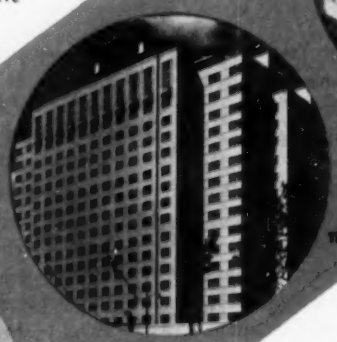
It's nice to know that when really fine ventilating and air conditioning performance is required, "Buffalo" Fans are selected for the job.

The three new post-war hotels, which have made front-page news, and the world's finest and fastest ocean liner, all depend on "Buffalo" Fans to maintain their "air of distinction".

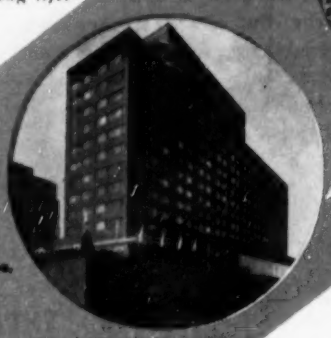
WHY?

The "Q" Factor—The built-in Quality which provides trouble-free satisfaction and long life.

Hotel Statler, Los Angeles



The Shamrock, Houston



Terrace Plaza, Cincinnati

We believe you'll agree that its more than coincidence that "Buffalo" Fans were chosen for these outstanding jobs.

We will continue to build the "Q" factor into "Buffalo" Fans, Air Cleaning and Conditioning Equipment, so that you may continue to specify it, with the assurance that you'll get your money's worth.

Engineering Sales Representatives in all principal cities are anxious to work with you.

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

171 MORTIMER ST. BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

PUT 'EM IN FAST...AND FORGET 'EM!

"Low return lines"

"Only one principal moving part"

You Can Put Dunham Vacuum Pumps in fast . . . and for less . . . because they're simple to install. For instance, return lines are at such low level, 9⅛", there's no need for expensive "pitting." You just set three anchor bolts in the floor . . . and your Dunham pump is in to stay.

You Can Forget Dunham pumps once they're in, too. For they pull and maintain . . . at low amperage . . . up to 26" vacuum without dependence on close clearances—and do it for years without repairs. For you see, there's only ONE principal moving part.

A single motor, mounted high and dry, easily handles BOTH air and condensate removal. Full range of sizes and types, both single and duplex models. Clip coupon for complete information.

Dunham Condensate Pumps assure fast, positive removal of condensate. Completely wired, ready for immediate use. Side-mounted motors. Anchor bolts—not bars and bed plates—secure pump to floor. Single and Duplex models.

DUNHAM VACUUM PUMPS

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

C. A. DUNHAM COMPANY
Dept. HPAC-8, 400 W. Madison St.,
Chicago 6, Illinois

Please send Pump Bulletin.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

5 reasons why you when you handle Trane

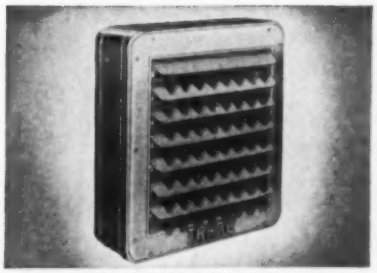
1. SERVICE—Over 250 TRANE sales engineers in 87 U.S. offices are specially trained to assist you . . . are available when you need them. Their equipment recommendations are accurate since they're based on the most complete line of soundly engineered heating products.

2. QUALITY—The popularity of TRANE Unit Heaters has been built over many years as a result of a reputation for quality, dependable service, exclusive features. These time-tested products give you extra freedom in selecting *from one source* the exact units to fit the job.

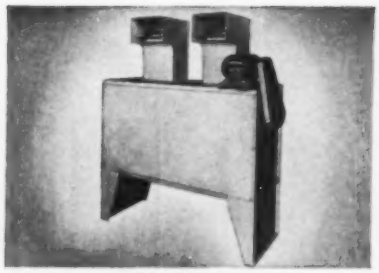
Build better heating into your

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

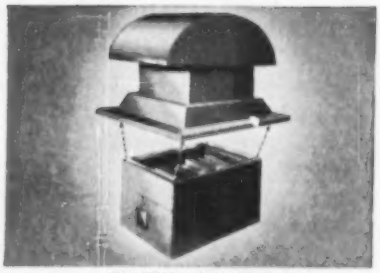
make your job easier
Unit Heaters



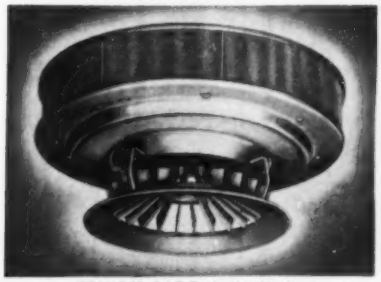
TRANE Model H Unit Heater



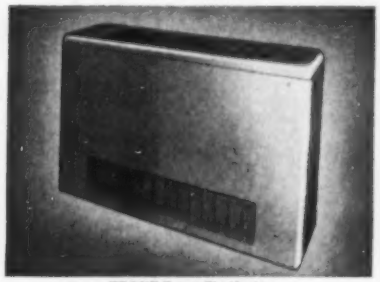
TRANE Torridor



TRANE Ventilating Heater



TRANE Model P Projection Heater



TRANE Force-Flo Heater

TRANE Gas-Fired Unit Heater

3. Complete line of engineered blower and propeller-type unit heaters includes these six types in a wide range of sizes and capacities. For steam, hot water or gas; with vertical or horizontal air streams; for free delivery or with duct work; floor, wall or ceiling mounted units.

4. Most complete library of useful information. TRANE bulletins give detailed roughing-in dimensions, piping diagrams, accurate capacity ratings. Contact your TRANE sales office for complete facts or write to TRANE, La Crosse, Wis.

5. Units in jobber stock. Model P, Model H, gas-fired units and matching steam specialties—traps, strainers, valves—are available from many jobbers. Local stock speeds installation, saves delays.

next job with TRANE Unit Heaters

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 87 U. S. and 14 Canadian Offices

Back of These Products
is a name
that you can trust

HENRY

VALVES, DRIERS & STRAINERS

HENRY VALVE CO.

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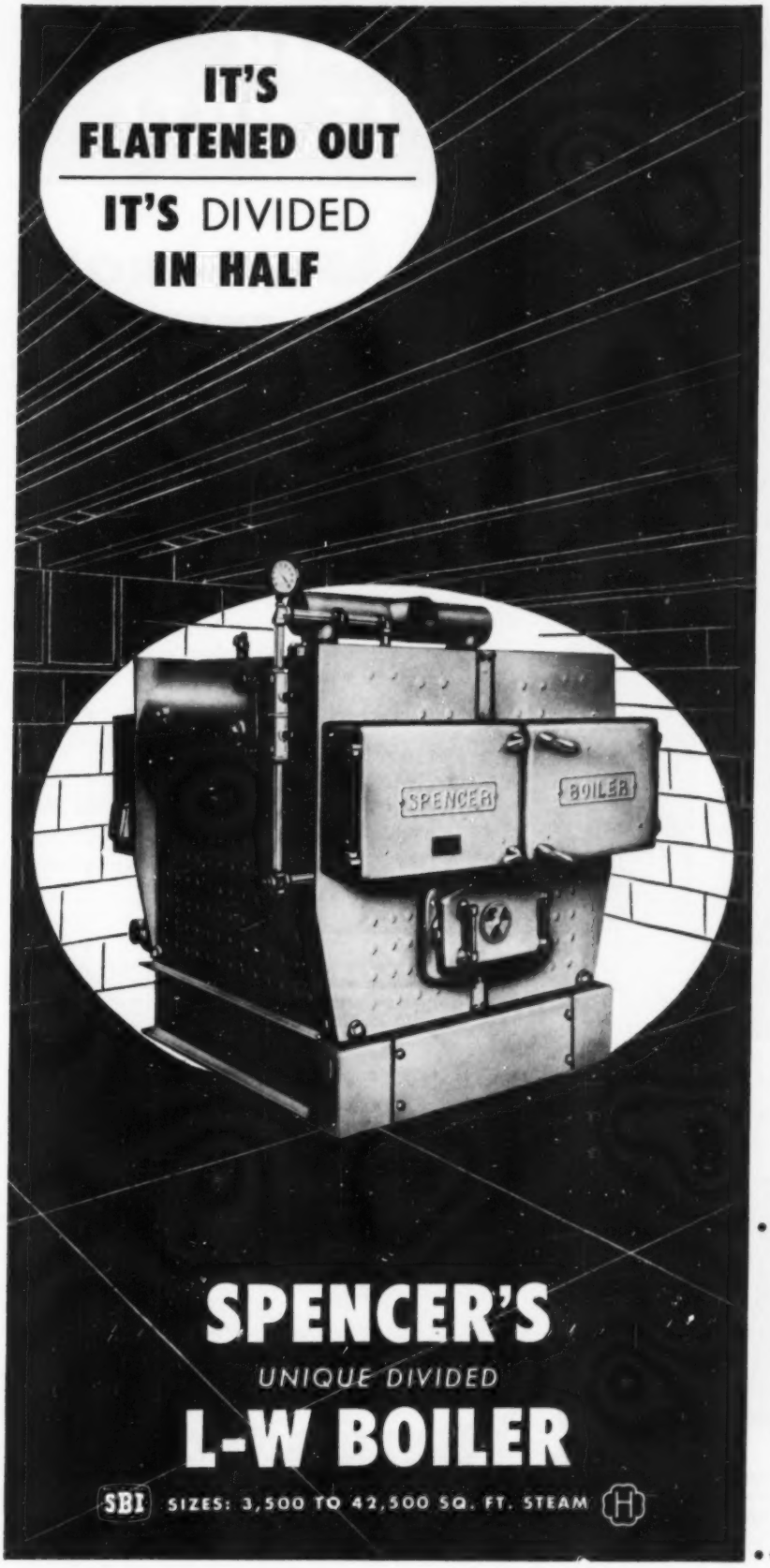
CONTROLLING FLOW
SINCE 1914

MELROSE PARK, ILL. (Chicago Suburb)
CABLE: HEVALCO MELROSE PARK, ILL.

Valves • Driers • Strainers • Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications



MAJOR ADVANCE IN BOILER DESIGN

Solves Narrow Doorway and Low Headroom Problems

Because it's divided in half and flattened out, the new Spencer Low-Waterline Boiler offers unique advantages over every other boiler in the field.

In existing buildings, this boiler's exclusive divided design permits entry through narrow doorways. Though its two watertight sections can be moved in separately, they require no welding for installation.

In new buildings, it cuts excavation costs by making possible lower basement ceilings. The L-W is 25% lower than conventional firebox boilers.

It has other time-tested Spencer advantages. It's self-cleaning. It's fast steaming, thanks to staggered rows of fire tubes. It can be quickly converted from mechanical to hand firing.

Let Spencer's Low-Waterline Boiler solve your heating problems. Learn more about it today. Clip and mail the coupon below.

SPENCER HEATER
LYCOMING-SPENCER DIVISION
WILLIAMSPORT avco PENNSYLVANIA

Spencer Heaters — Dept. HP-83
Lycoming-Spencer Division
AVCO Manufacturing Corporation
Williamsport, Pennsylvania

Dear Sirs:

Please send additional information on Spencer's Divided L-W Boiler to:

Name_____

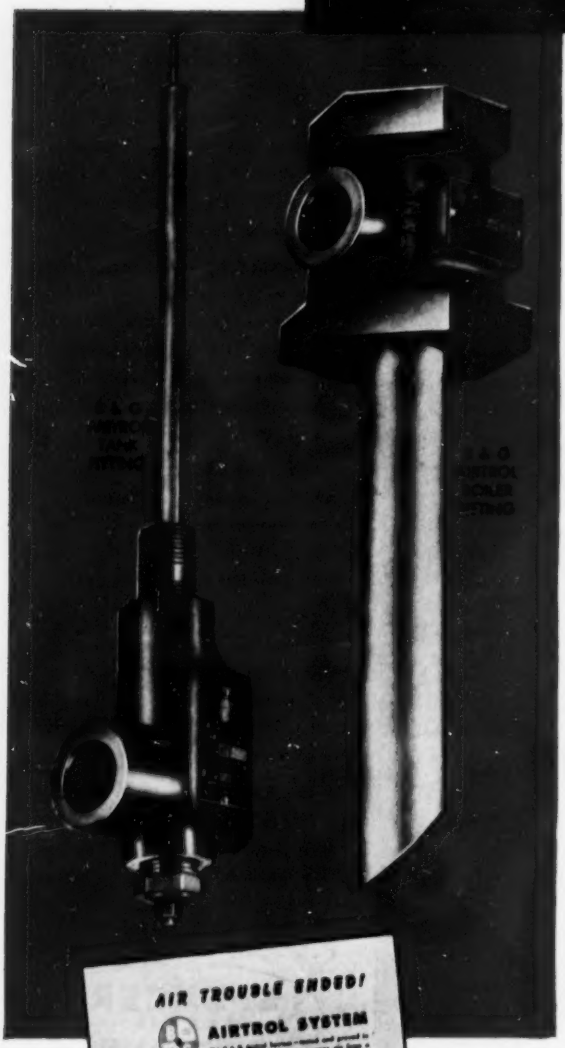
Position_____

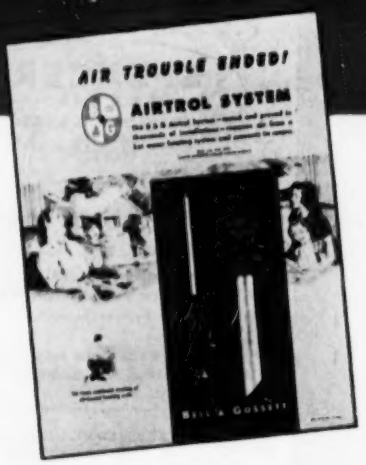
Company_____

Address_____

City_____ Zone_____ State_____

REMOVES AIR ...KEEPS IT OUT!





The complete story of the B & G Airtrol System, with installation and operating instructions is given in this folder. Send for your copy today.

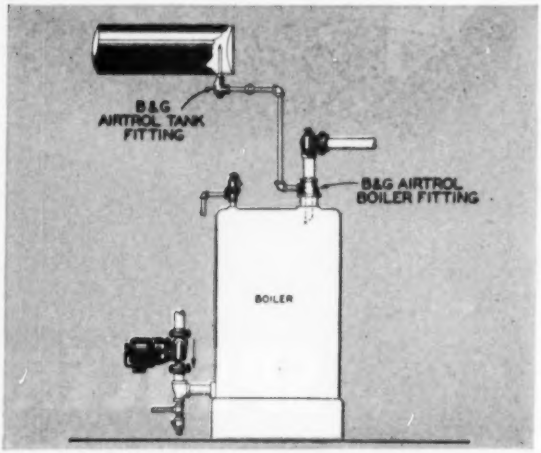
B&G AIRTROL SYSTEM

. . . ends continual venting of air-bound heating units

Really sensational—tested and proved successful in thousands of installations! The B & G Airtrol System positively eliminates air accumulation in forced hot water heating systems—an annoying problem never before satisfactorily solved.

The B & G Airtrol System consists of two parts—the Boiler Fitting and the Tank Fitting. Their combined function is to trap air in the compression tank and prevent its return to the boiler, piping and heat distributing units.

Airtrol units can be installed on any cast iron or steel hot water heating boiler—an amazingly simple and effective remedy for air-binding.



BELL & GOSSETT COMPANY

Dept. DB-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto

"You can figure SURE savings"

Just make Dorex Air Recovery part of your air conditioning or ventilating installations. You'll please your clients with results like these —

In a New York skyscraper, Dorex Air Recovery eliminated the need for two large ducts up through 39 floors—saving expensive space as well as critical metal.

In a Pittsburgh building, Dorex Air Recovery cut the required air conditioning intake in half, saving some $47,000 on original equipment.

In Chicago, a large industrial plant installed Dorex and so reduced required boiler capacity that estimated fuel savings run about 2,500 tons of coal a year.

During the past twenty years, more than 10,000 Dorex installations have been made. Mail the coupon today for full information. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR ENGINEERING CORPORATION

dorex®

air recovery

CONNOR ENGINEERING CORP.
Dept. A-83, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

Name.....

Position.....

Company.....

Street.....

City..... Zone..... State.....

Samuel G. Wiener, FAIA; E. M. Freeman, CE, architects and engineers; Paul O. Rottmann, associate electrical and mechanical consultant

This Honeywell Customized Temperature Control installation helps you

Learn about <u>your</u> business—from an airport

Why customized temperature control is becoming a "must" for all types of buildings

How do you make sure of comfort in a modern building that has lots of glass and a spread-out design?

In particular, how do you answer this over-all question when your building has a dozen varying comfort requirements such as a high ceiling lobby with busy outside doors, a waiting room that's often crowded, many small private offices, separate storage and baggage areas?

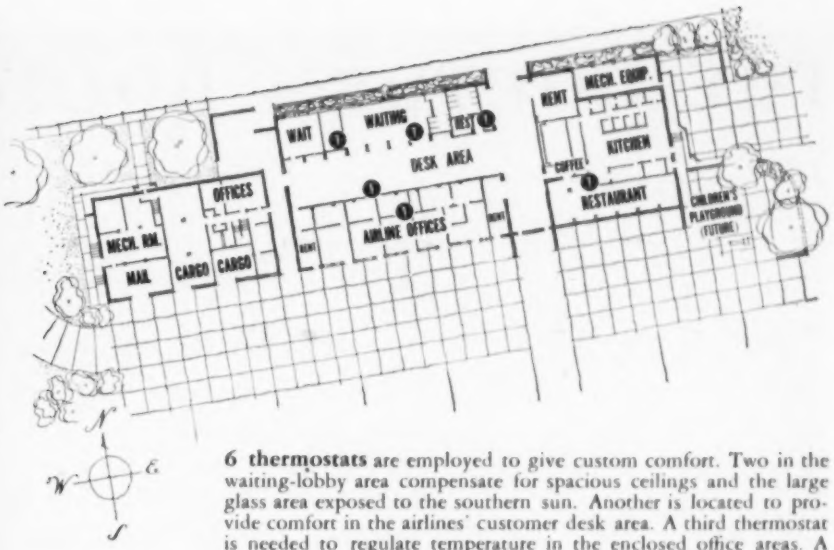
And how do you make sure, operating 24 hours, the temperature control system will give the flexible, dependable service you *must* have?

With modification, these major questions which Shreveport, La., airport officials and their professional advisers had to answer, can be applied to the businesses of your clients. The answers can be stated in five words: Install Honeywell Customized Temperature Control. This is the answer officials of the Shreveport airport have found eminently satisfactory. It is the answer for you, too.

Key reason why this is so is found in the word *customized.* This means that whatever the control requirements, Honeywell Customized Temperature Control *designed to meet the needs of your building* is your solution. This applies to heating and cooling, ventilation and humidity control.

The customized installation in the case of the Shreveport airport included careful selection and strategic placement of thermostats as indicated on the floor plan.

Two of the specific problems solved by the Honeywell Customized Temperature Control installation are brought out in the captions beneath the small photos.



6 thermostats are employed to give custom comfort. Two in the waiting-lobby area compensate for spacious ceilings and the large glass area exposed to the southern sun. Another is located to provide comfort in the airlines' customer desk area. A third thermostat is needed to regulate temperature in the enclosed office areas. A fourth, in the restaurant, compensates for heat loss (or intake) through big south windows.

The problem in the counter area was to provide comfort—for passengers and airline personnel. Comfort load varies greatly with occupancy of room, the amount of heat or cold coming from outside. But with Honeywell Customized Temperature Control in charge of comfort, conditions are right all the time.

The problem in the dining room was to provide comfort regardless of "weather effects" of large windows, and whether there were two diners—or two hundred. And with Honeywell Customized Temperature Control on the job 24 hours a day it's comfortable in the dining room—no matter what.

For comfortable, even temperature in new or existing buildings—of any size—use Honeywell Customized Temperature Control

Whether it's an airport, hospital, apartment, church, school, office, factory, store, garage—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate"—and save fuel besides.

For facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 104 across the nation. Or mail the coupon today.

Claude L. Hamel, Shreveport airport manager, says:

"It's true that we've got a great many temperature control problems here. And it's gratifying to report that Honeywell Customized Temperature Control handles them all so well."

MINNEAPOLIS **Honeywell**

H HONEYWELL

First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HA-8-160, Minneapolis 8, Minnesota
Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

Name .....

Firm Name .....

Address .....

City ..... *Zone* ..... *State* .....

THE DOCTOR'S DOCTOR

THERE is more to the selection of tube than meets the eye.

You will readily agree that first you must learn "where the tube will be used—and under what conditions" before you are able to select the proper tube.

Some have aptly termed us the "Doctor's Doctor". On modest reflection, we accept the designation and the responsibility of prescribing the correct tube for specific applications much as "The Doctor's Doctor"

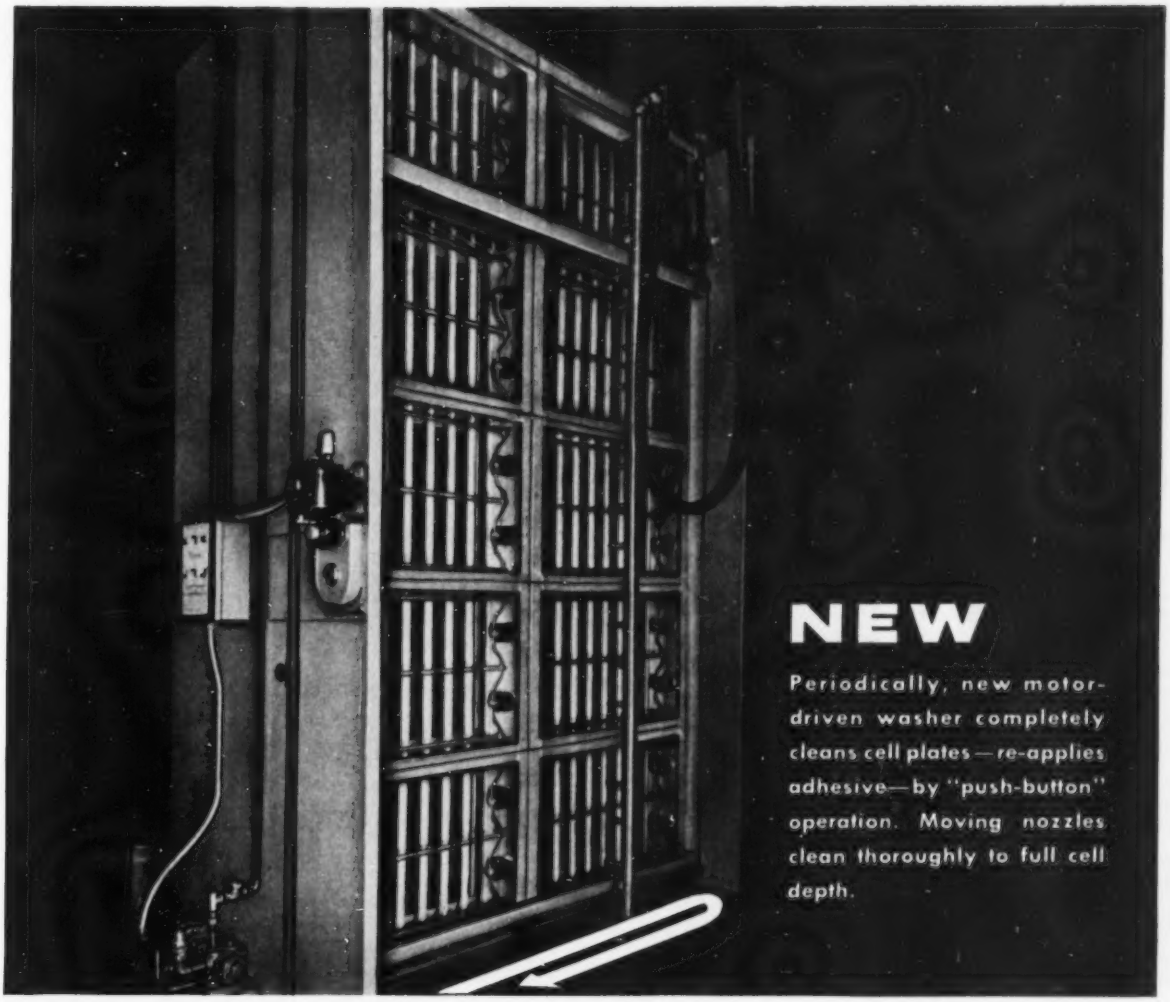
Having performed countless "cures" we have naturally earned the reputation throughout industry.

And why not? Today's "cures" result from yesterday's education—encompassing over 36 years' experience in tube manufacture and tube application. Many of the "cases" we have encountered during this long period were of the very kind from which you may now be seeking relief.

Whenever you face the problem of selecting tubes of the right alloys with respect to the materials they must handle under certain conditions, you'll find it most practical to invite our Customer Engineering Service to have one of our specialists counsel with you.

Any of these tubes can be delivered to you immediately from our nearest Mill or Mill Depot, or they can be fabricated to any desired form according to your blueprints.

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing
1419 CENTRAL AVENUE • DETROIT 9, MICHIGAN
ESTABLISHED 1916
Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*
Export Dept. 13 E. 40th St., New York 16, N. Y.



NEW

Periodically, new motor-driven washer completely cleans cell plates—re-applies adhesive—by "push-button" operation. Moving nozzles clean thoroughly to full cell depth.

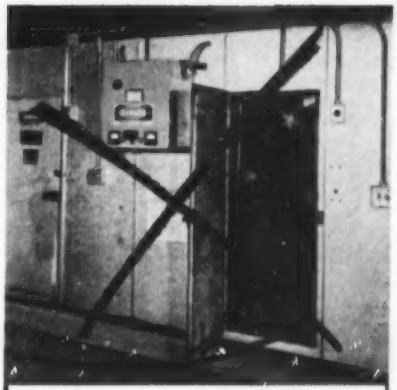
NOW—"PUSH-BUTTON" WASHING FOR ELECTRONIC AIR CLEANER

Now, a new, low-cost, automatic PRECIPITRON® washer cuts maintenance costs and eliminates unpleasant inside-the-duct washing of cells.

This unique device features moving nozzles, making PRECIPITRON the easiest electronic air cleaner to service. After thoroughly cleaning the plates, the washer re-applies adhesive. Entire operation is under "push-button" control. Laboratory and field tests have proved that moving-nozzle washing is a "must" for proper cleaning.

Type PX PRECIPITRON, the electronic air cleaner, traps microscopic airborne particles of dirt, dust, grime and pollen which would pass through conventional filters. It fits into any heating, ventilating or air conditioning ductwork.

Learn how PRECIPITRON will keep the air in your building dirt-free at negligible cost. Call your local Westinghouse-Sturtevant office, or write: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.



Maintenance men no longer need to enter enclosure to clean PRECIPITRON. New "push-button" feature does away with hot, wet tasks.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE ... IF IT'S Westinghouse J-80521

Today's lesson in radiant heating:

SPANG® CW provides healthier comfort

An important new R has been added to the traditional 3 R's of Readin', 'Ritin' and 'Rithmetic at Washington-Douglass Elementary School—and that's Radiant heating.

This recently-completed, modern school at Jackson, Tennessee, containing 16 classrooms, an elevated auditorium, gymnasium, audio-vision room, library and janitor's quarters, accommodates 460 children. And these students are more comfortable . . . and healthier . . . all winter long with a modern radiant heating system.

Heating comfort inside is controlled by an outdoor temperature detector which adjusts the heat in the building to compensate for outside temperatures.

Spang CW Steel Pipe was specified for this radiant-heating installation for two reasons:

1. **Spang CW is easier to cut, weld, bend and thread, making installation faster and keeping installation costs low.**
2. **Spang CW is quality-controlled from steel to finished product, providing a top-flight product for a permanently-sealed heating system.**

Architects, engineers, contractors and owners who buy the best materials for any commercial, industrial or residential installation know from experience that Spang quality-controlled CW Pipe will give them a workable product plus years of trouble-free service.

It pays to buy quality. You'll find it in Spang CW. Specify Spang CW Steel Pipe on your next order.

OWNER:
City of Jackson, Tennessee

ARCHITECT:
Spencer & Ross, Jackson, Tennessee

CONTRACTOR:
McCrory Construction Company
Memphis, Tennessee

PLUMBING AND HEATING CONTRACTOR:
Brady-Horne Plumbing & Heating Company
Jackson, Tennessee

SPANG

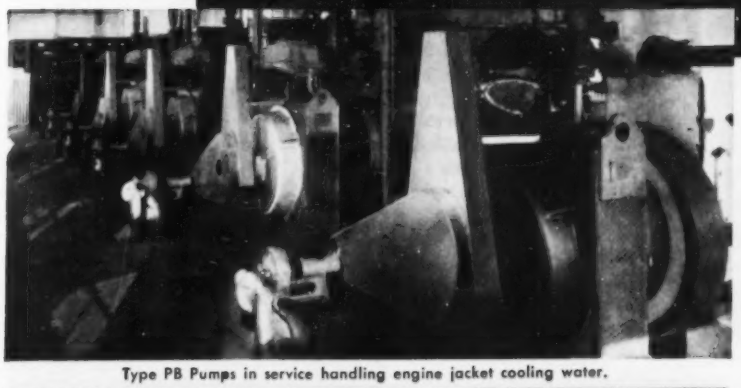
SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Pittsburgh 30, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.

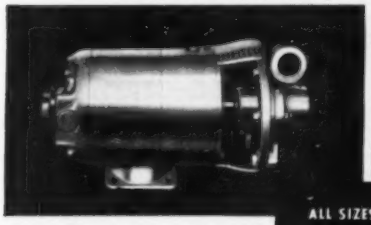
BIG OR SMALL — INDOORS OR OUT YOU CAN SAVE ON COST AND SERVICE WITH PEERLESS *FLUIDYNE* PUMPS

PEERLESS PUMPS



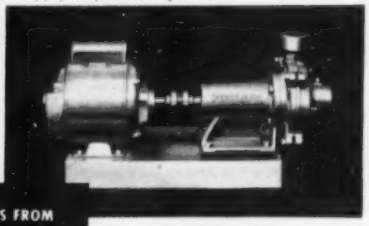
Type PB Pumps in service handling engine jacket cooling water.

Type PB Pumps providing water supply to pressure system.

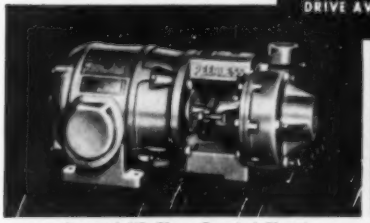


Fractional HP Close Coupled Electric Type PE Fluidyne Pump

ALL SIZES FROM ¼ H. P. to 150 H. P. ALL TYPES OF DRIVE AVAILABLE



Fractional HP Flexible Coupled Type PB Fluidyne Pump



Integral HP Close Coupled Electric Type PE Fluidyne Pump

Integral HP V-Belt drive Type PB Fluidyne Pump

10 REASONS WHY THESE PEERLESS END SUCTION PUMPS OUTPERFORM IN GENERAL PURPOSE APPLICATIONS

1. They're ECONOMICAL. Designed with economy in first cost, installation, maintenance and operation—all without compromise in quality.
2. They're DURABLE. Every consideration has been given in design and construction to assure long service life even under abnormal service.
3. They're EFFICIENT. In all sizes, types and models the Fluidyne line is characterized by high performance ratings.
4. They're VERSATILE. Indoors or out, every general utility pumping service can use Peerless Fluidyne Pumps.
5. They're COMPACT. Space costs money; Fluidyne pumps fit neatly into both piping and pumping layouts as well as into subassemblies.
6. They're EASILY MAINTAINED. No special tools are required to perform ordinary pump maintenance in the Peerless line.
7. They're DEPENDABLE. Ample safety factors assure performance on continuous or intermittent duty, regardless of mounting angle.
8. They're GOOD LOOKING. Pleasing, trim and compact, their sturdy exterior design makes for neat installations.
9. They're HYDRAULICALLY CORRECT. Peerless impeller and volute design assure nonpulsating, non-turbulent liquid flow.
10. THE LINE IS COMPLETE. The Peerless Fluidyne line is one of the broadest offered by any manufacturer. Drives: electric, belt or flexible coupled; Hp range: from ¼ to 150 hp; Capacities: up to 5500 gpm; Heads: up to 260 ft. Write for descriptive bulletin today.

NEW BULLETIN
describes additional features of both fractional and integral hp pumps in the Peerless Fluidyne Line. Write for your copy of this 24-page fully illustrated and descriptive bulletin by mailing coupon today for Bulletin B-2300.

MAIL COUPON TODAY

Peerless Pump Division,
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, Calif.

Please send without obligation new Bulletin B-2300 describing Fluidyne line of fractional and integral hp pumps.

NAME_____
COMPANY_____
STREET_____
CITY_____ STATE_____
HPAC

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Los Angeles, Calif. and Indianapolis, Indiana.
Offices: New York; Atlanta; Chicago; St. Louis; Phoenix; Fresno; Los Angeles; Tulsa; Dallas, Plainview and Lubbock, Texas; Albuquerque, New Mexico.
Distributors in Principal Cities; Consult your Telephone Directory.

PEERLESS PUMPS fmc

MOTORIZED CHIMNEY DRAFT

with the WING DRAFT INDUCER

No boiler can operate satisfactorily or efficiently over wide ranges of weather or load with variable natural draft. The fuel—whether oil, gas or coal—must have enough oxygen for complete combustion. There must be sufficient draft or furnace fires will be slow burning and lifeless, resulting in uneven, insufficient and irregular heat.

WING Draft Inducers insure positive, adequate, uniform draft regardless of variable weather conditions or inadequate chimney or breeching construction.

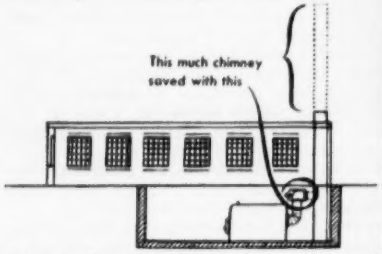


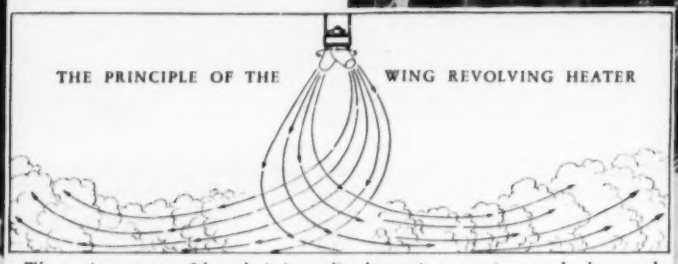
Diagram above shows how much chimney is saved by installing Wing Draft Inducers.

Wing Draft Inducers are suitable for use in connection with oil, gas, stoker-fired or hand-fired heating boilers, industrial furnaces or kilns, or high pressure steam boilers, either stationary or marine. Sizes are available for boilers as low as 1000 sq. ft. E. D. R. up to steam generators producing 100,000 pounds of steam/hr. Special, heavy duty designs available for these larger boilers.

Wing Draft Inducers are made in two types—for insertion in breeching or flue, or for installation on top of a chimney. Write for a copy of Bulletin I-52 to L. J. Wing Mfg. Co., 140 Vreeland Mills Road, Linden, New Jersey.

HEAT THAT MOVES AROUND

THE fact that the discharge outlets of WING Revolving Unit Heaters keep the heated air in constant, gentle motion is one of the reasons why nationally known firms like the Budd Company have installed them in their plants, both at Philadelphia and in the one shown in this photograph, at Gary, Indiana. The big blanking and forming presses in this great plant present a natural barrier to ordinary fixed discharge heating systems, but not to the moving streams of heated air from the WING Revolving Heaters, even suspended, as they must be, far above the floor, to clear the cranes. That is equally true in the summer time when, with steam turned off, the cooling breezes from the revolving discharge outlets keep workers comfortable on the hottest days. Investigate. Write for Bulletin HR-6.



The moving streams of heated air (or cooling breezes in summer) sweep slowly around through 360 degrees, covering successively every direction. The air velocity is sufficient to carry to walls, and remote corners and the constantly changing direction of flow causes the air to find its way around obstructions.

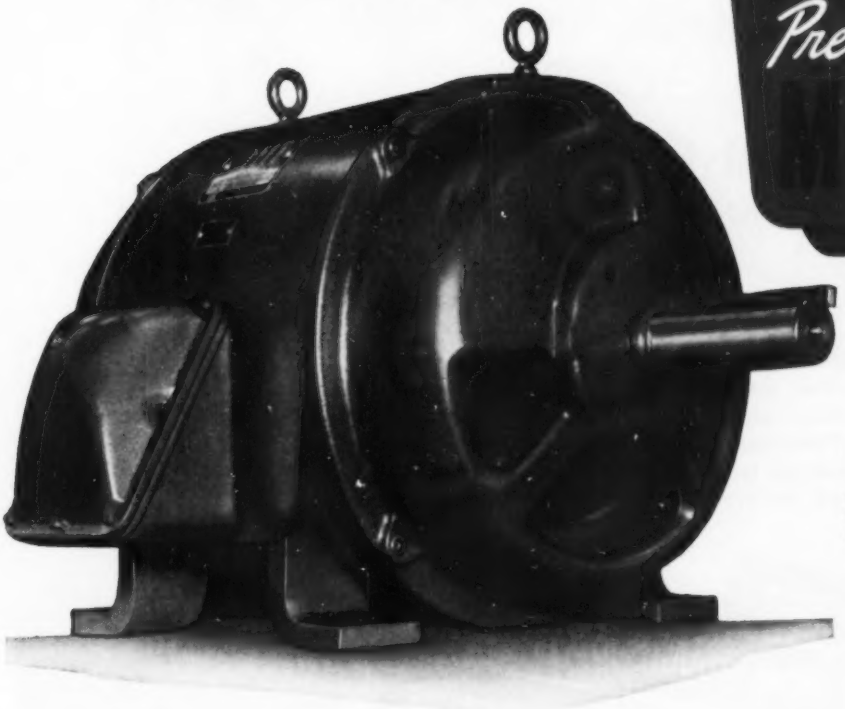
Wing

L. J. Wing Mfg. Co.
140 Vreeland Mills Road
Linden, New Jersey
Factories: Linden, N.J. and Montreal, Can.
In Europe: Etab. WANSON, Brussels, Belgium

FOR FAN SERVICE...

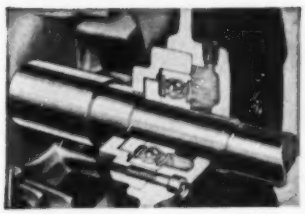
"All motors are NOT alike!"

Precision-Built MOTORS



Reliance Protected Open A-c. Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from ¼ to 300 hp.

- ☆ Low starting currents... liberal ratings
- ☆ Smooth acceleration... quiet operation
- ☆ Tough, vibration-proof Reli-X insulation



... AND THE BEST PRE-LUBRICATED BEARING DESIGN

The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease 'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1458D

RELIANCE ELECTRIC AND ENGINEERING CO.

1822 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities

FASTENING COSTS CUT AGAIN!

PLUS-POWER JOBMASTER

A year ago, we introduced the newest development in powder-actuated fastening, the RAMSET JOBMASTER, with important features which have helped make it the most widely used tool in the industry.

NOW, with no sacrifice of these valuable advantages, we announce the new PLUS-POWER JOBMASTER, to bring still more economy and versatility to the high-speed, low-cost RAMSET SYSTEM for fastening into steel and concrete.

SAVE 1/3 POWER LOAD COST... DO MANY MORE "TOUGH" JOBS... WITH PLUS-POWER JOBMASTER

You can make substantial savings in many of your heavy-duty fastening jobs with the new PLUS-POWER JOBMASTER, with ⅜" barrel. Using lower price, light-duty loads, this new RAMSET Tool will set most Tru-Set ⅜" heavy-duty studs and drive pins, thus cutting ⅓ off your powder load costs.

Further savings are gained through the use of our new Tru-Set ⅜" Flat Head Drive Pins, which require no discs or disc adaptor, and cost considerably less than comparable heavy-duty pins.

Best of all, you obtain these new economies with the same speed, ease and convenience of the standard JOBMASTER which have made it the outstanding favorite for high-speed, low-cost fastening into steel and concrete.

Ask for demonstration . . .

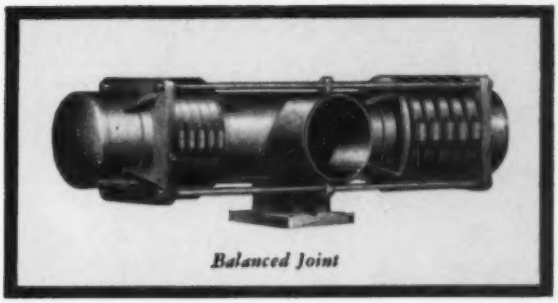
If you now use a JOBMASTER, let your dealer show you the advantages of a plus-power assembly for your present tool. Or, if you use any other powder-actuated tool, or none at all, see how PLUS-POWER JOBMASTER gives you 2-tools-in-1, to drastically cut costs, reduce work and save time for fastening into steel and concrete. Call your dealer or write us for details.

Ramset Fasteners, INC.

Ramset Division, Olin Industries, Inc.

12117 BEREA ROAD • CLEVELAND 11, OHIO

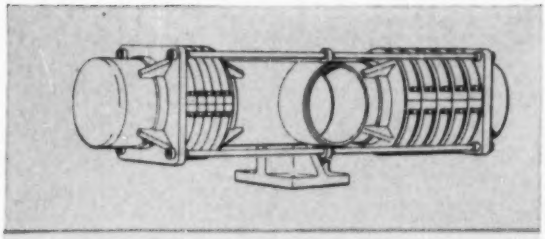
ANOTHER Olin PRODUCT



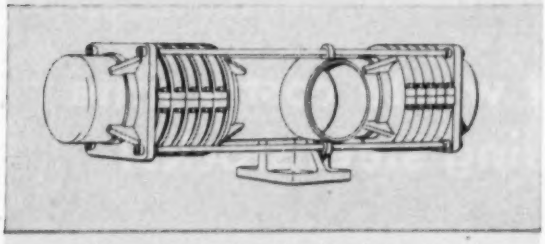
Balanced Joint

FOR A BALANCED SELECTION

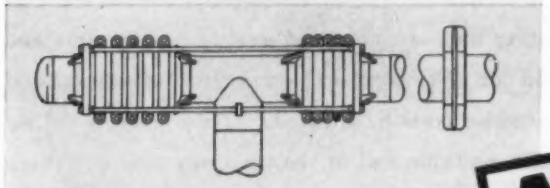
Look First at ADSCO *Corruflex* EXPANSION JOINTS



Balanced Joint Before Absorbing Expansion.



Balanced Joint After Absorbing Expansion.



When pipeline is in service, element absorbing expansion is compressed; other is extended.

• Buying an expansion joint from ADSCO is like shopping in a super-market. Everything you need is under one roof. Offering the world's most complete line of both slip and packless expansion joints, ADSCO is the only manufacturer able to supply the right joint for every purpose. ADSCO's complete line is backed up by an engineering service which since 1877 has found exact solutions to customers' special problems.

An example of ADSCO's versatility is the Corruflex Balanced Joint illustrated here. This packless expansion joint is designed to accommodate axial motion and eliminate end thrust at pipe intersections. The rods tie the joint ends together, thereby transmitting the end thrust to a distant point where adequate anchorage is available. The joint thus requires only the equivalent of an intermediate or stabilizing anchor.

So when you're shopping for expansion joints, come to ADSCO first. You won't have to look elsewhere . . . Call your ADSCO representative or write for Bulletin 35-51A.

EXPANSION JOINTS • HEAT EXCHANGERS • TRAPS

ADSCO ENGINEERED PRODUCTS

STRAINERS • SEPARATORS • METERS

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

Since 1877

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't waste costly time rehandling steel stocks!

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

UNLOADING and distributing bulk shipments of steel to storage area and then to production and job sites demand added time, manpower and equipment. Eliminate these added costs by letting U. S. Steel Supply deliver your steel to the spot, in the condition and at the time you need it. Fifteen warehouses with the most modern steel handling and delivery equipment assure your complete satisfaction.

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DIVISION

General Office
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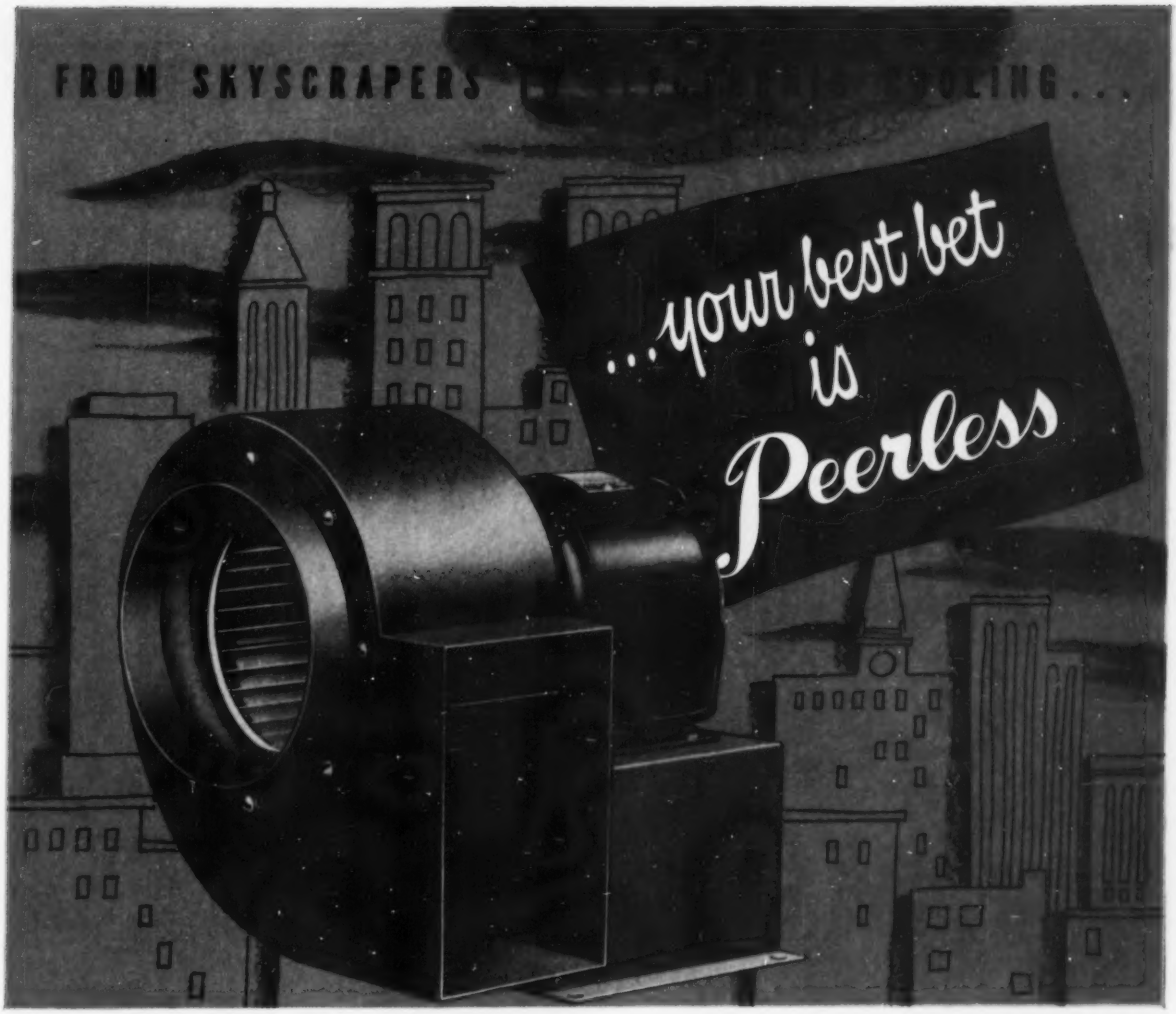
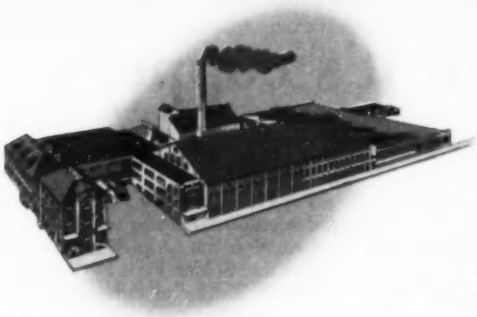
Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL



YOU HAVE FACTORY CONTACT-DIRECT

FOR FANS AND BLOWERS WITH JOB-MATCHED *Peerless* MOTORS



Whatever your needs . . . large or small, many or few . . . Peerless has the answer with a complete line of quality-built fans and blowers. If you need special services, rapid delivery, engineering aid or special designs . . . you'll get them and get them quickly at Peerless.

Since 1893, Peerless Electric has been headquarters for all types of air-moving equipment, so, no matter what your plans . . . whether you're designing skyscrapers or cooling electronic mechanisms, it'll pay you to get the facts first from Peerless. Write today for illustrated catalog SDA 160.

"SMOOTHEST PERFORMERS ON THE MARKET"

FAN AND BLOWER DIVISION

THE PEERLESS ELECTRIC COMPANY

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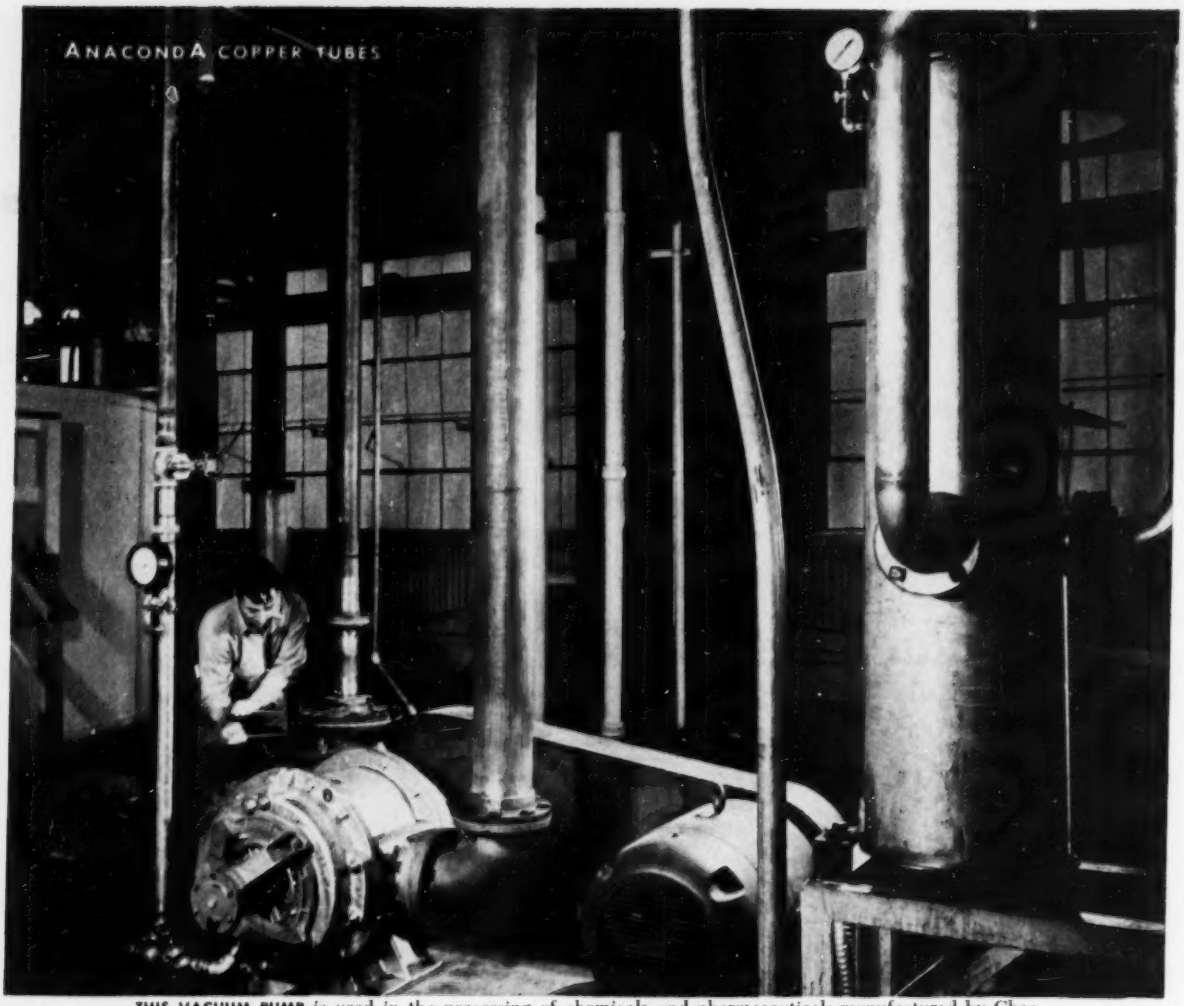
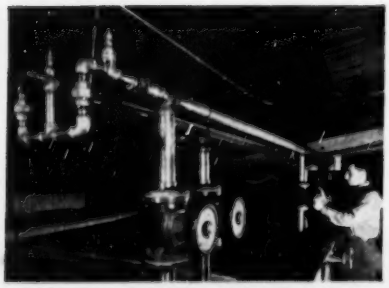


THIS VACUUM PUMP is used in the processing of chemicals and pharmaceuticals manufactured by Chas. Pfizer & Co., Inc. 4-in. copper tubes and 6-in. red brass pipe are used for suction and discharge lines.

Your plant piping will last longer —can cost less when it's copper



THESE CHEMICAL PROCESS LINES of 1½-in. and 2-in. copper tubes in the Chas. Pfizer & Co., Inc. plant use both copper solder-type and S.P.S. bronze fittings joined by silver-alloy brazing.

NOT ONLY the first cost, but how long it will last and how much it costs to install are the measures of true industrial piping costs.

Where corrosion shortens piping life, where rust and scale form to restrict flow and increase pumping costs, there you should consider copper's corrosion resistance and immunity to rust—properties that endow copper piping with its long life.

Lightweight copper tubes are far less costly to erect; when used with solder type fittings, they cost far less to install than heavy, threaded pipe. In fact, it is not unusual for labor savings to bring the installed cost of a copper tube, solder fittings system below that of rustable piping.

For examples of the wide use of copper in industrial piping and for detailed information on ANACONDA Copper Tubes and Solder Type Fittings, let us send you a copy of Publication C-24. Write to *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 5336

for copper piping call an

ANACONDA®

Distributor

American Blower – a time-honored name in air handling

It takes only a few minutes to learn how much better your heating can be with American Blower Unit Heaters.

And, for years after you install them, you'll get the benefits of their lower fuel costs, lower maintenance costs and exceptionally long life.

Heavy duty coils, unobstructed outlets for maximum heat diffusion, completely enclosed moving parts are but a few of the quality features which make these units outstanding. They carry Certified Ratings—and are sound-rated, too.

For data, phone the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

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YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

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YOUR NEW
ALCO CONDENSED CATALOG
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ALCO VALVE COMPANY • ST. LOUIS, MISSOURI
NEW MODELS MORE CONTROLS NEW SIZES NEW RATINGS NEW DESIGNATIONS
. . . . . there is an ALCO valve for every need
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Designers and Manufacturers of
Thermostatic Expansion Valves;
Evaporator Pressure Regulators;
Solenoid Valves; Float Valves;
Float Switches.
5712

The fittings that revolutionized pipe welding . . .

In the year 1931 Taylor Forge gave industry its *first real line* of seamless, butt-welding pipe fittings. We say it was the first *real* line because it was the first to include not only long and short radius ells, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, caps and welding neck flanges.

This was a fully planned development. Many years before Taylor Forge had foreseen the future of the butt-welding fitting . . . had realized that pipe welding could not go beyond its then crude stage until pipe users were given *all* the fittings necessary to make up complete piping systems.

So Taylor Forge went to work on this and after long research and development came out with the full line that became the inspiration of modern pipe welding.

Naturally the organization that started ahead has kept ahead . . . in design, in quality, in breadth of line. That is why so many men who have followed the development of the WeldELL line, refuse to consider any other kind of welding fittings.

TF

For up-to-the-minute facts, see your Taylor Forge distributor

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill. 716-0852

Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

NEW THRUSH TANKS

Reduce Draining Time

DRAIN COMPLETELY IN A FEW MINUTES

THE VACUUM BREAKER NOW IN ALL THRUSH PRESSURE TANKS

NO EXTRA COST

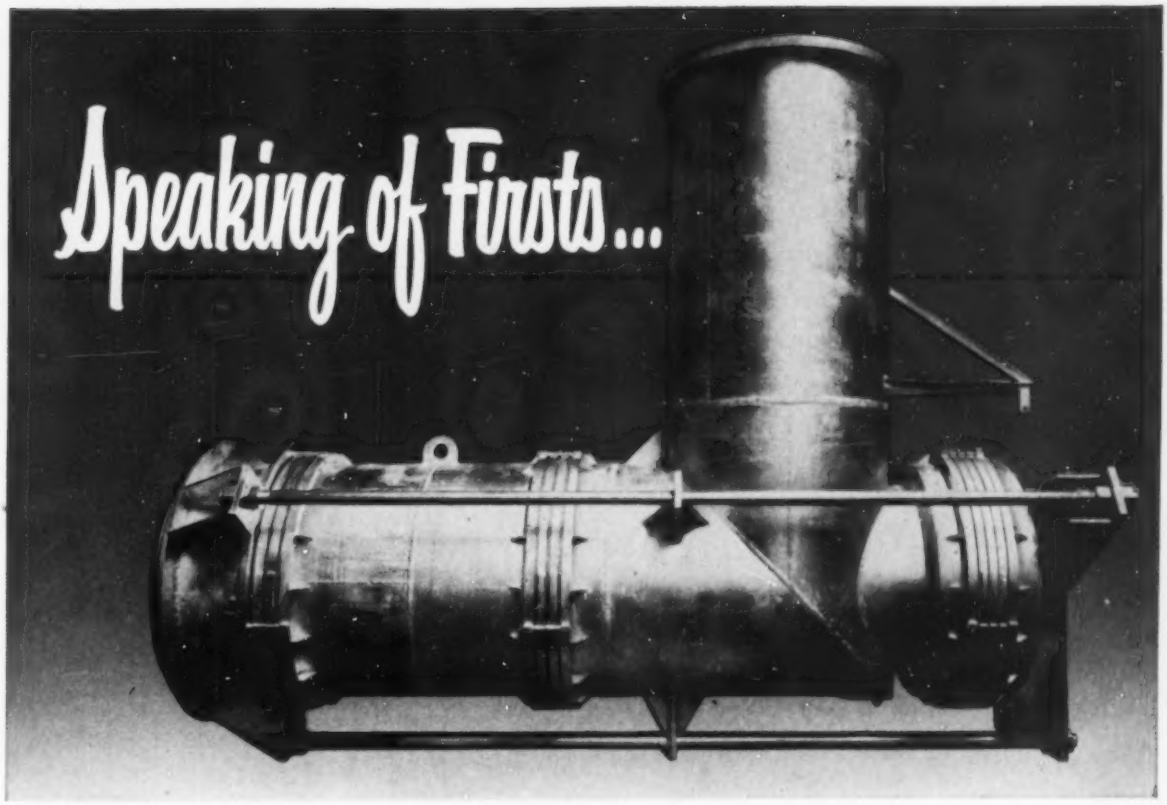
THE FIRST REAL IMPROVEMENT IN TANK DESIGN IN MANY YEARS! THRUSH ENGINEERING LEADS AGAIN!

HERE'S AN ADDED convenience feature found only in Thrush Pressure Tanks! It saves your time! . . . saves labor! Reduces service bills! Pleases customers because you can get the system back in operation without delay. No need to drain the whole system. Just close the stop valve, open the drain and unscrew the Vacuum Breaker to allow air to enter the tank. A thirty gallon tank will drain in ten minutes. You get more for your money . . . build greater customer satisfaction, too . . . when you install genuine Thrush equipment. Ask your wholesaler about it or write Dept. E-8.

TO BE SURE IT'S A GENUINE THRUSH PRESSURE TANK . . .
LOOK FOR THE VACUUM BREAKER BEFORE YOU BUY!

H. A. THRUSH & COMPANY

PERU, INDIANA



Recently, Zallea was given the assignment of developing a group of 48-inch expansion joints for flight propulsion test facilities on a classified defense project. The rigid technical specifications of this advanced application required "tailor-made" units for the job, so Zallea engineers analyzed the problem and designed the unusual-looking joint pictured above . . . the first of its kind. Actually, it is a Balanced Pressure, Universal Self-equalizing expansion joint, originally developed by Zallea engineers in 1945, operating at 165 psi and incorporating internal stainless steel turning vanes to provide a smooth flow of gases through the right angle bend. The unit absorbs 3" axial and 1.27" lateral movements through a temperature range from −100° F. to +650° F. No anchors are required since this arrangement neutralizes end thrust developed by internal pressures.

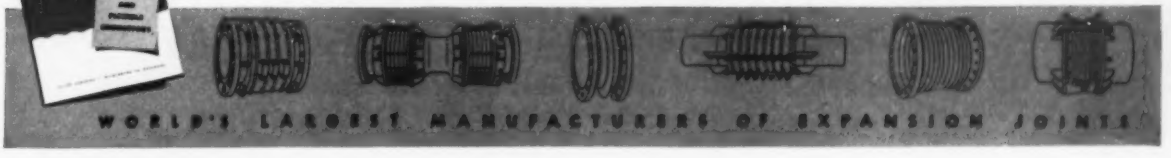
This example is representative of our ability to cope with the most difficult expansion joint problems. It is our business to specialize in the design and manufacture of one product only—expansion joints—and over the years we have learned how to solve the "tough ones" effectively and quickly.

Zallea Expansion Joints are available in diameters from 3 inches to 30 feet . . . for temperatures from sub-zero to 1600° F. . . . for pressures from vacuum to 300 psi in standard designs, and up to 2,000 psi in special designs.

The next time you are faced with an expansion problem, get in touch with us. We will be glad to survey your situation and recommend the most practical and economical solution. Zallea Brothers, 816 Locust Street, Wilmington 99, Delaware.

For detailed information on Zallea Expansion Joints and services write today for a free copy of Bulletin 351.

Zallea
EXPANSION JOINTS



an ACCO product

Here is a NEW All-Purpose Gate Valve that is Easy to Sell

• Used for hot and cold water lines or low pressure steam—in plumbing, heating, and air-conditioning systems—in homes, apartments, restaurants, offices, stores, hospitals, industrial plants.

The strong, amply-sectioned body will not distort nor will seat warp under soldering temperatures. The R-P&C Bronze Solder End Gate Valve has full, unobstructed flow. For use with K, L, and M copper tubing. Working pressures: steam—125 lbs.; cold water, oil or gas (non-shock)—200 lbs.

Here is a stock item that has rapid turnover because of its general usefulness. Write today to nearest R-P&C district office listed below for information and prices.

No. 90 R-P&C Bronze Solder End Gate Valve

R-P&C valves

ACCO

TRADE MARK

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

BIG sales-push for hot water heating is coming your way!

American-Standard starts the push with this ad in the September 21st issue of

LIFE

DON'T FREEZE NEXT WINTER!
Modernize your old heating system now... install an
American-Standard Boiler
for hot water heating at its best
Pay as little as $1.76 a week*
Ask your American-Standard retailer to show you the magic of hot water heating
AMERICAN-Standard
HEATING

Be ready to present the sales-closing story on the Magic of Hot Water Comfort

NOW is the time to put extra effort into selling hot water heating equipment, *before* the chill of winter forces your prospective customers to get heating equipment in a hurry.

American-Standard is ready to help you, with this biggest of all heating promotions.

For the first time, a major manufacturer is utilizing the full impact of LIFE magazine in a special drive to urge homeowners to modernize their heating systems, with American-Standard hot water heating equipment. And they are invited to see their American-Standard retailer for information on the magic of hot water comfort. Don't miss this chance to boost *your* sales. Stock up now with American-Standard boilers and baseboard heating panels.

American Radiator & Standard Sanitary Corporation
P. O. Box 1226, Pittsburgh 30, Pa.

SALES AIDS AVAILABLE

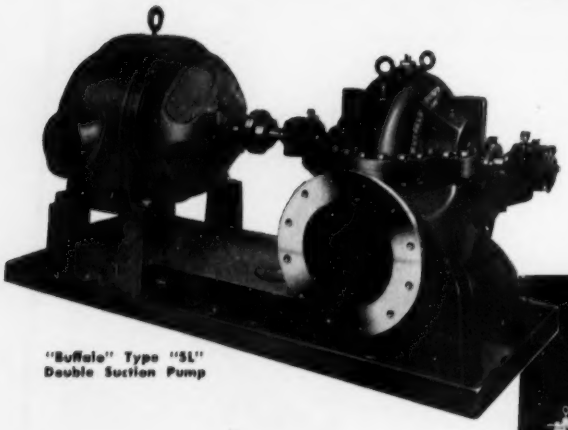
It's easy to tie-in with this big LIFE promotion . . . American-Standard has prepared a special sales-making promotion kit to help you. It includes a Display Unit, Direct Mail Package, eye-catching Window Streamer, LIFE tie-in Counter Card and Wall Poster, and a "Selling" Booklet—over $20.00 worth of material for only $10.00! Contact your heating distributor or your American-Standard sales office for your order.

AMERICAN-Standard
HEATING

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

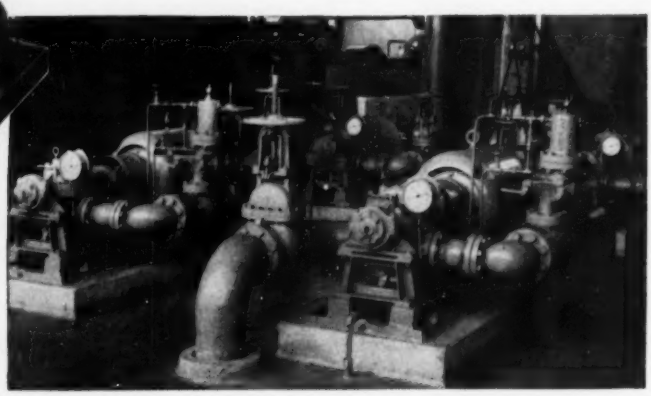
FORD USES "Buffalo" FEED WATER PUMPS for its MODERN NEW LIVONIA TANK PLANT BOILER HOUSE

Recently completed Boiler House at Ford's Livonia, Mich. Tank Plant, in which "Buffalo" Pumps supply feedwater. Designed by Albert Kahn Associated Architects & Engineers, Detroit.



"Buffalo" Type "SL" Double Suction Pump

Below, Four "Buffalo" Double-Suction Feedwater Pumps in the new Ford Plant. Three are rated at 250 gpm and the fourth at 75 gpm. Note heavy, rugged bearings.



Like all "Buffalo" Pumps, type "SL" Double-Suction Pumps provide the *economy* of *quality*. The greater efficiency, longer life, and easier maintenance of these ruggedly-built units save you money over the years. Enclosed impellers and hydraulic balance insure top performance. Ball bearings at both ends of oversize impeller shaft prolong life. Maintenance is simplified by horizontally divided casing, allowing convenient impeller inspection and care without disturbing piping.

"Buffalo" Type "SL" Pumps are also giving highly satisfactory performance in some of the country's biggest air conditioning installations, supplying air washers and handling chilled water. Available in capacities from 10 to 14,000 gpm with heads up to 350 feet.

WRITE TODAY FOR BULLETIN 955

"Buffalo" BUFFALO PUMPS, INC.

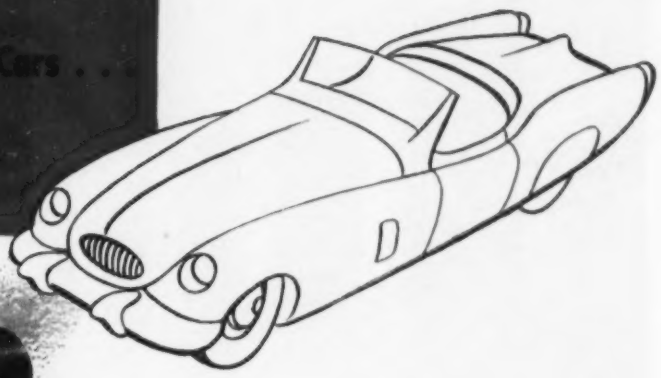
171 MORTIMER STREET BUFFALO, N. Y.

Subsidiary of Buffalo Forge Company

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

As Modern as Today's Sports Cars . . .
. . . and just as efficient



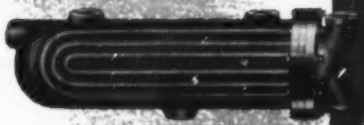
INSTANTANEOUS WATER HEATERS.
No tank required. 23 sizes; capacities to 300 gpm.; uses live or exhaust steam.

CONVERTERS.
26 sizes for economical heat transfer.

TANK HEATING UNITS.
20 sizes for all requirements.

STORAGE TANKS.
10 sizes; capacities to 315 gals.

FUEL OIL HEATERS.
17 sizes; capacities to 375 gph. at 2 lbs. pressure.



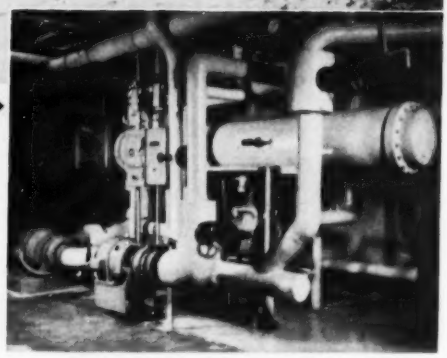
INDIRECT HEATERS.
15 sizes for use with large-size storage tanks.

This specialized line of Industrial Fluid Heaters

Precisely engineered for maximum efficiency, this modern line of GENERAL Fluid Heating Specialties meets a wide variety of industrial applications. Whether you are planning a completely new installation, or the expansion or modernizing of an old one — you'll find a GENERAL unit that will give you efficient, extra long service at low cost. Detailed information is available in Catalog 60. Write for your copy. General Fittings Co., Dept. A, 123 Georgia Ave., Providence 5, R. I.

GF

Melting snow automatically is the job of this compact installation, placed in a basement corner of the John Hancock building.



p-k *insures* *John Hancock*

against snow underfoot

Slippery, icy, snow-covered sidewalks are a thing of the past at John Hancock Mutual Life Insurance Company in Boston. Tubing permanently embedded in the sidewalk carries ethelyene glycol solution, heated by a **p-k** snow melting converter. Snow is melted as it falls and drains away.

The **p-k** snow melting converter at John Hancock has capacity to heat 225 gpm of 50% ethelyene glycol solution from 160°F to 180°F with steam at 40 psig., using 976 feet of ¾ in. 18 gauge copper tubing. The system was designed and installed by Buerkel and Company, Inc., Boston contracting engineers.

Like the John Hancock Company, you will find sidewalk heating a means of promoting goodwill and increasing foot traffic. At the same time you get *insurance* against damage suits resulting from slippery sidewalks, plus definite snow removal time and labor savings. Write **p-k** now for information on snow melting equipment or any heat exchange problem.

P

the **Patterson-Kelley Co., inc.**

780 Burson St., East Stroudsburg, Penn.

1971

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difficult shapes and angles...

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● To facilitate handling of your more complicated jobs . . . to meet the requirements of exacting clients . . . always use U·S·S Galvanized Steel Sheets on all types of ductwork installations, from small pipe residential heating units to large air conditioning systems for plants and offices.

U·S·S Galvanized Steel Sheets are fabricated from high-quality carbon steel, with a uniformly heavy coating of zinc that won't flake or crack, assuring lasting protection from rust and corrosion. Because all U·S·S Steel Sheets are uniform in flatness, ductility and workability, they can be bent, cut, stamped, welded or soldered quickly and easily.

Your customers know and appreciate the quality that stands behind the U·S·S Label appearing on U·S·S Galvanized Steel Sheets. It will pay you—in satisfied customers and repeat orders—to cash in on the wide acceptance of this well-known product.

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TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
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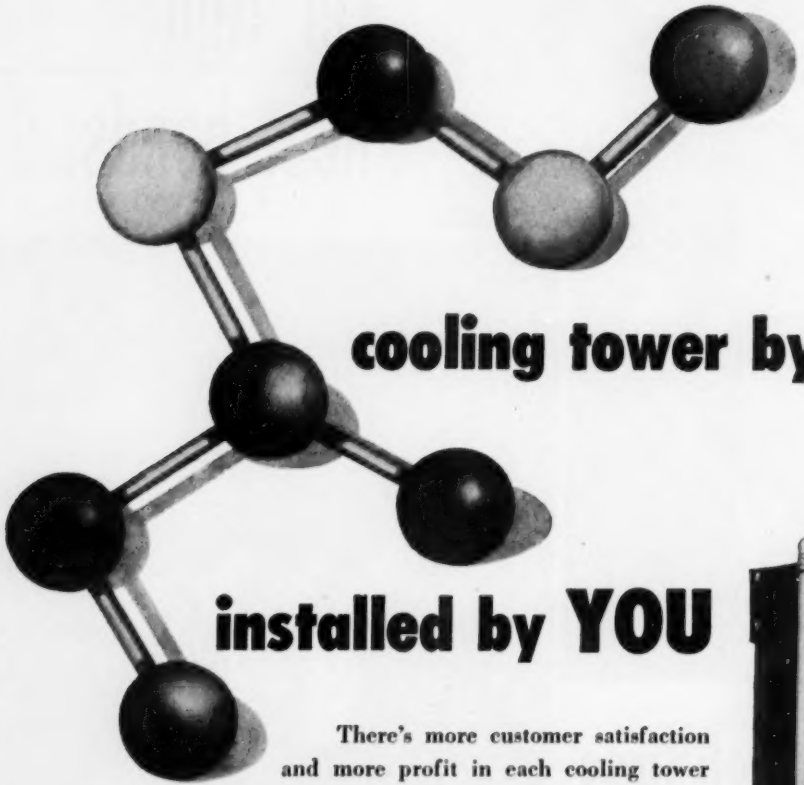
U·S·S GALVANIZED STEEL SHEETS

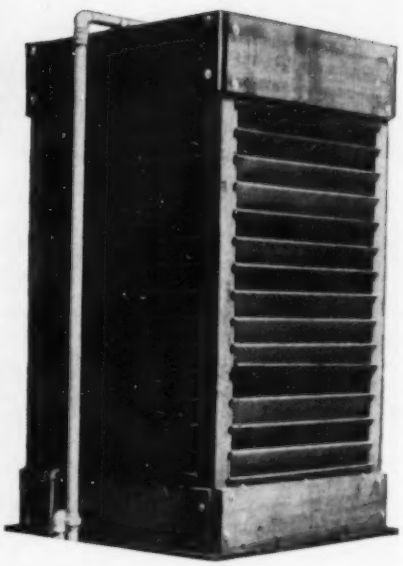
UNITED STATES STEEL

Formula for complete customer satisfaction:



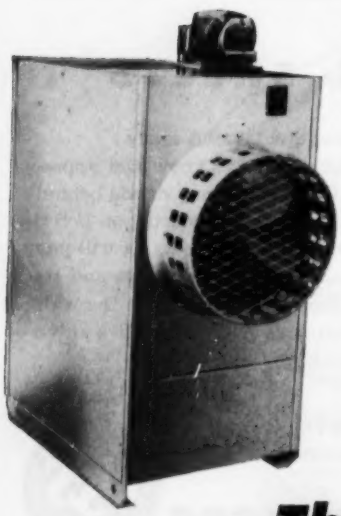
cooling tower by MARLEY

installed by YOU



There's more customer satisfaction and more profit in each cooling tower sale when you team up with Marley, world's leading producer of water cooling equipment.

The sale itself is easier — for Marley is the best known and most widely advertised name in cooling towers. Installation is no problem, because Marley designs and packages its towers to make your job as easy as possible. And the performance record of Marley Aquatowers* and natural draft towers over the years, in every type of service, is your assurance of lasting, trouble-free performance for your customers.



Easy to sell . . . simple to install . . . sure to satisfy — these are the advantages of linking your good name with that of the Marley Company this year. And this is the year when these advantages are most important, for 1953 will be your busiest year!

*Reg. Trademark

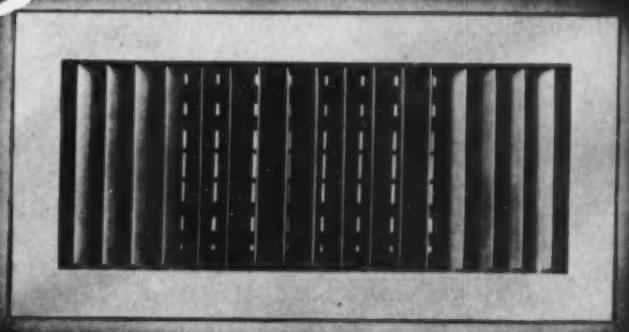
The Marley Company

Kansas City, Missouri

MARLEY®

NEW ... with OPPOSED BLADE DAMPERS

SERIES 277



4-WAY Air-foil REGISTER

Series 277 combines 4-way directional grille with opposed blade damper. This provides both maximum directional control and positive volume control. Opposed blade dampers supply uniform distribution of air over entire grille face.

LATEST AND FINEST PRODUCT OF TITUS ENGINEERING. It stands out... by any comparison ... in its *beauty, rugged design ... superior diffusion performance.*

FRAMES ... Heavy gauge cold-rolled steel. One piece.

BORDER ... 1¼" beveled edge.

LOUVERS ... Streamlined. Smooth as glass. Solid section.

LOUVER DEPTH ... ¾". Assures positive air deflection.

SCREW HOLES ... Countersunk for No. 6 screws. Spaced ½" on center from outer edge of border.

FINISH ... Gray lacquer primer as standard. Other finishes available at slight extra cost.

GASKET ... ¼" sponge rubber.

ADJUSTMENT ... Individual louver adjustment for front and center set of louvers. Opposed acting damper blades in rear are key operated.

• BRAND NEW 1953 CATALOG. Simplifies specifying. Provides all engineering data you need.

REQUEST YOUR FREE COPY NOW, including all specification and engineering data plus facts on construction, performance and selection of outlets.

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

- ☐ Air conditioning outlets
- ☐ Return air grilles and registers
- ☐ Volume controllers
- ☐ Perforated metal and ornamental grilles
- ☐ Door ventilators
- ☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

- ☐ RUSH information on Series 277.
- ☐ Send complete New 1953 catalog.
- ☐ Send literature on above checked items.

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Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

Heres the single-phase general purpose motor you need...

to give you

SIMPLIFIED DESIGN
LOW UPKEEP COST
MINIMUM SERVICING
LESS VIBRATION-NOISE
YEARS OF RELIABLE SERVICE

Type RA—integral horsepower

Wagner Type RA

Pioneered by Wagner more than half a century ago, the repulsion-start induction motor is truly industry's "general purpose" motor because it combines the best features of two types of motors: the repulsion motor during the starting period and the induction motor while running at rated operating speeds. Today, the Wagner Type RA Motor offers the most simplified, troublefree design available and is still the standard by which all other single-phase motors are judged.

Type RA is preferred by many users for single-phase applications because of its ability to start heavy loads with low current and with a minimum of light flicker. It is especially suitable for machines that have high inertia or heavy friction at starting.

This Wagner Motor has been proven to be the most troublefree single-phase motor available. It's trim . . . it's compact—and it will build real customer satisfaction for your product.

When you standardize on Wagner Motors—you get the advantages of a liberal warranty . . . of nationwide service facilities, with on-the-spot service, replacement motors and parts available from 25 Wagner-owned Service Branches and more than 750 Authorized Service Stations. You can choose from a wide variety of types and sizes—single-phase or polyphase—(from 1/125 to 400 hp.) Bulletin MU-185 gives complete information—write for your copy.

® Wagner Electric Corporation
EST. 1891

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

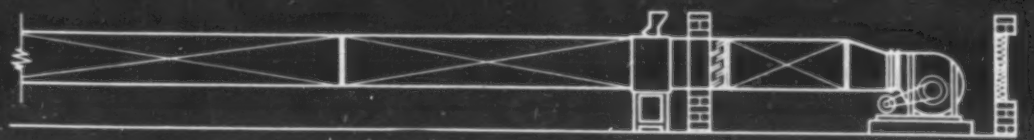
Stainless Steel

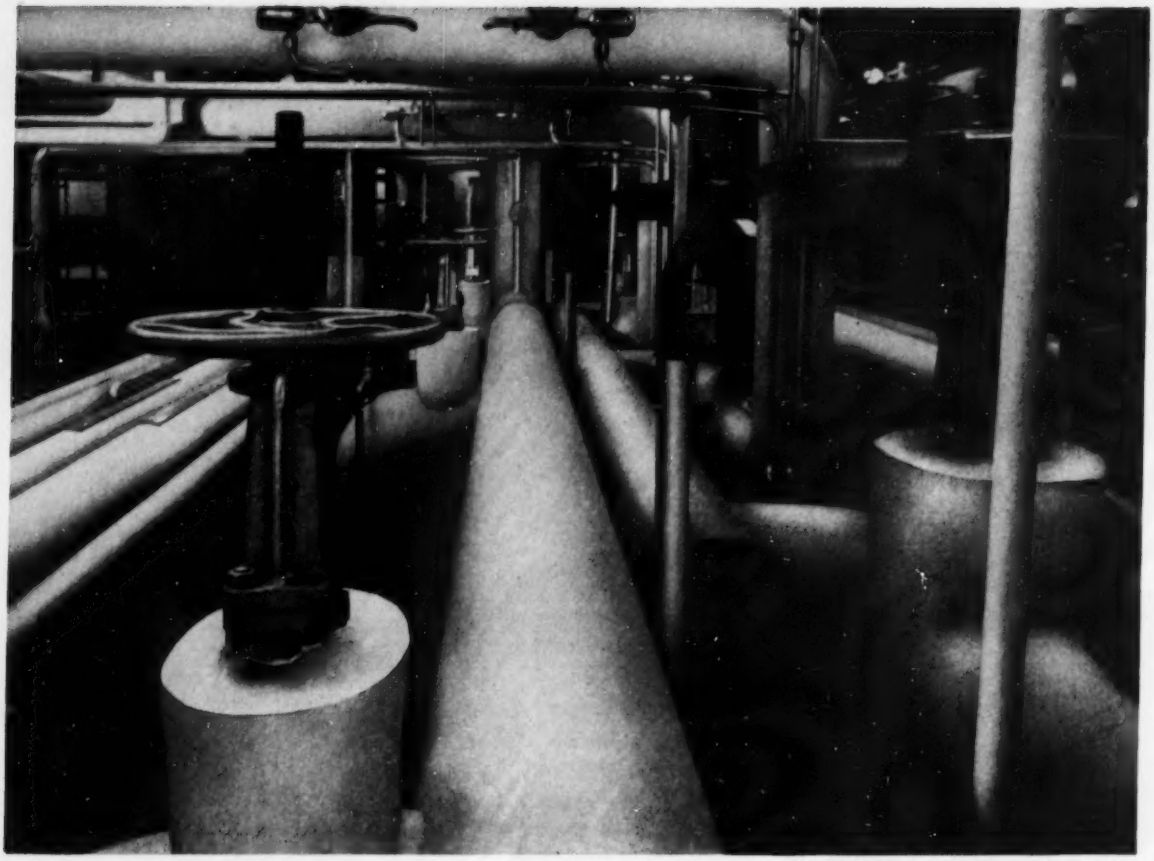
duct furnaces are manufactured by the

HAYES Furnace Co. used in series with coolers and refrigeration systems for longer life

Please write for catalog and nearest representative

HAYES Furnace Mfg. & Supply Co.





View of Pipe bay in large eastern utility plant, showing pipes insulated with K&M "Featherweight" 85% Magnesia.

FOR ECONOMY'S SAKE

Insulate with "Featherweight"

85% MAGNESIA

Save heat and you save money. Thousands of plants depend upon "Featherweight" 85% Magnesia to do just that. And no wonder!

"Featherweight" needs no introduction to thousands of users, many of whom first experienced its unusual qualities before this century began.

It is a superb insulation, low in thermal conductivity and not only effective on heated surfaces with temperatures up to 600° F., but when used in combination with K&M Hy-Temp Insulation, it is efficient up to 1900° F. This combination of double layers permits staggering all joints and eliminating heat loss through open joints when expansion occurs.

Keep this heat-saving, money-saving insulation in mind for applications in *your* company's plants. It will serve you well—always! For detailed information on "Featherweight" 85% Magnesia, see your local K&M distributor, who is an experienced applicator, or write directly to us.

Nature made asbestos . . .
Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
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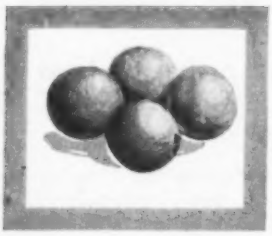
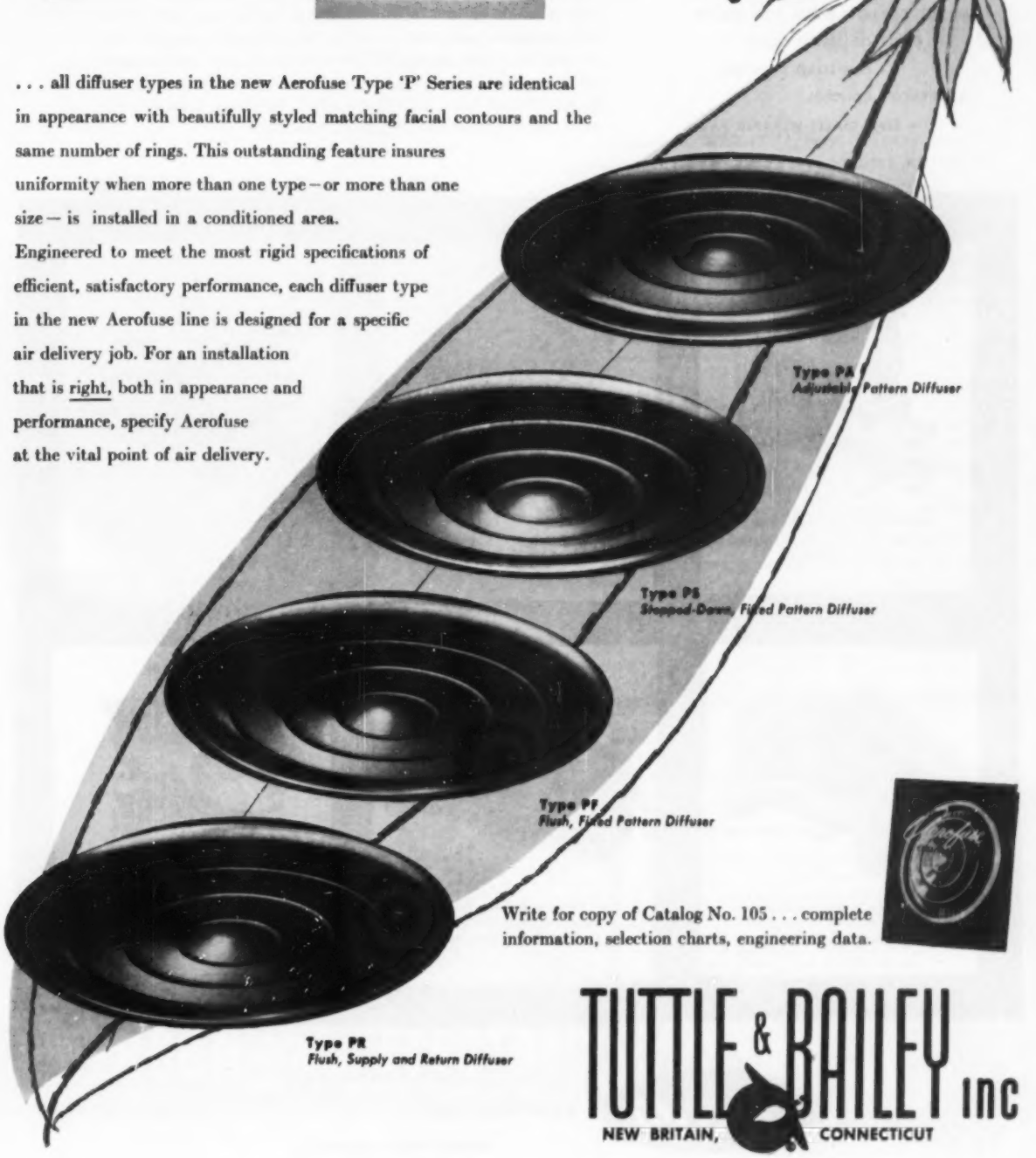
Like  in a pod...

. . . all diffuser types in the new Aerofuse Type 'P' Series are identical in appearance with beautifully styled matching facial contours and the same number of rings. This outstanding feature insures uniformity when more than one type—or more than one size—is installed in a conditioned area.

Engineered to meet the most rigid specifications of efficient, satisfactory performance, each diffuser type in the new Aerofuse line is designed for a specific air delivery job. For an installation that is right, both in appearance and performance, specify Aerofuse at the vital point of air delivery.



Type PA
Adjustable Pattern Diffuser

Type PS
Stepped-Down, Fixed Pattern Diffuser

Type PF
Flush, Fixed Pattern Diffuser

Type PR
Flush, Supply and Return Diffuser

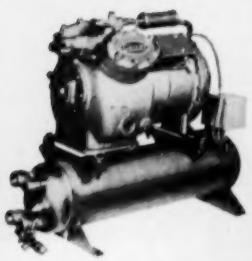
Write for copy of Catalog No. 105 . . . complete information, selection charts, engineering data.

TUTTLE & BAILEY inc
NEW BRITAIN, CONNECTICUT

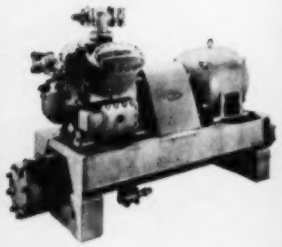
18 sizes in this complete line of competitive Carrier compressors

- IN ANY CAPACITY FROM 3 TO 200 HP
- BELT OR DIRECT DRIVE
- LOW-LOAD STARTING
- CAPACITY CONTROL
- REPLACEABLE WEARING PARTS

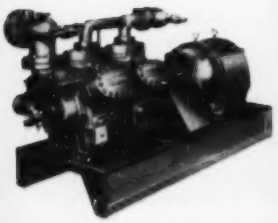
Want a compressor that'll fit a job exactly at its maximum point of capacity . . . that will help keep your bid low by providing refrigeration at lowest possible cost per ton? You can be sure that one of these adaptable Carrier Reciprocating Compressors can do just that, and give you highly dependable performance as well. The complete line is available to contractors through Carrier Dealers and Carrier Branch Offices. Look in your Classified Telephone Directory. Or write Carrier Corporation, Syracuse, New York.



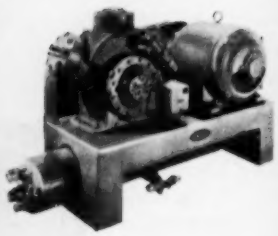
6D Series, heavy-duty hermetic condensing units; 3, 5 and 7½ hp
Freon-12, Freon-22



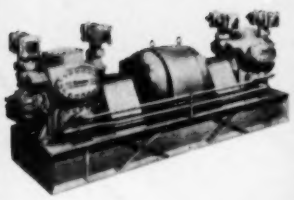
5F Series, direct drive condensing units; 7½, 10, 15 and 20 hp
Freon-12, Freon-22, Carrene-7



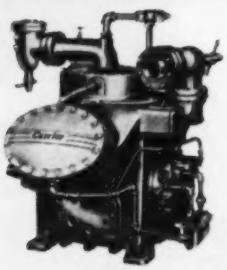
5H Series, direct drive compressors; 20, 25, 30, 40, 50, 60, 75 and 100 hp
Freon-12, Freon-22, Carrene-7



5F and 5H Series compressors in all sizes available for belt drive
Freon-12, Freon-22, Carrene-7, Ammonia



5H Series compressors in duplex arrangement; 60, 75, 100 and 125 hp
Freon-12, Freon-22, Carrene-7

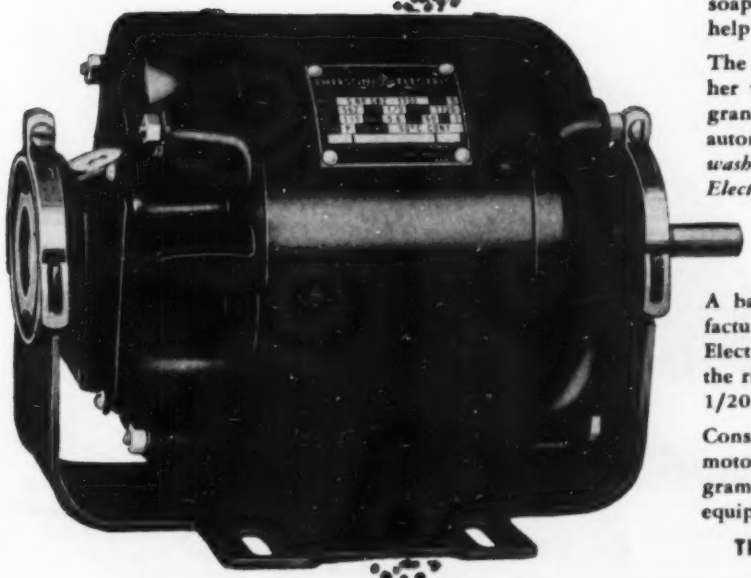


5J Series compressors; 75, 100, 125, 150 and 200 hp
Freon-12, Freon-22, Carrene-7, Ammonia

Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL HEATING

clothes come clean ... at home



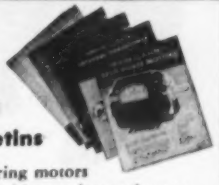
"Cleaner!" "Whiter!" "Quicker!" Those sprightly soap jingles would be meaningless, without the help of the modern washing machine!

The greatest compliment a housewife pays her washing machine is that she takes it for granted. She pushes a button . . . it operates automatically. *On many of America's best known washers and driers that button starts an Emerson-Electric motor.*

A background of 63 years of motor manufacturing experience stands behind Emerson-Electric motor design and production, offering the right motor for every job, in ratings from 1/20 to 5 h.p., or hermetic motors ⅛ to 20 h.p.

Consider the advantages of Emerson-Electric motors when planning your long-range program for top-flight leadership ratings on your equipment.

THE EMERSON ELECTRIC MFG. CO.
St. Louis 21, Mo.



Write for these Emerson-Electric Motor Data Bulletins

Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ M426-A Capacitor-Start
- ☐ M426-B Split-Phase
- ☐ M426-C Integral
- ☐ M426-D Fan-Duty
- ☐ M426-E Oil-Burner
- ☐ M426-F Jet Pump
- ☐ M426-G Blower

EMERSON ELECTRIC
MOTORS • FANS — APPLIANCES

SAVE PURCHASING MANHOURS...

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WHEN you put your TUBE TURNS' Distributor on your buying team, you can consolidate many orders into one . . . saving you valuable time. Your TUBE TURNS' Distributor assumes the responsibility of dealing with many manufacturers' salesmen and expediting and following through your orders.

TUBE TURNS' Distributors and TUBE TURNS, INC. are a service-minded team. Call your nearby TUBE TURNS' Distributor to save your purchasing time, to simplify your bookkeeping, and to obtain leading brands . . . brands that have got to be good.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

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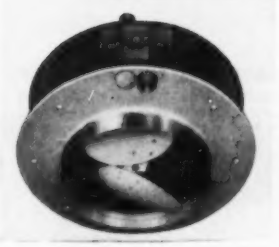
Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.

THE latest addition to the famous line of Herman Nelson unit heaters is the GAS FIRED model. The new heater is engineered to precision standards and designed for beauty and utility . . . finished in a smart grey-green baked enamel.

The new heater is operated equally well on all types of natural, manufactured or liquified petroleum gases . . . and it is available in seven sizes with heat input ranging from 25,000 to 200,000 B. T. U.'s per hour.

Another important feature of the new Herman Nelson Gas Fired Unit Heater is its economical installation. No expensive piping or boiler equipment is needed and for this reason it can be moved from place to place and will fit in small spaces.

Write for complete information to HERMAN NELSON HEATING AND VENTILATING PRODUCTS, DEPT. HP-8 AMERICAN AIR FILTER COMPANY, INC., LOUISVILLE 8, KENTUCKY



HORIZONTAL AND VERTICAL UNIT HEATERS

With the addition of the new Gas Fired Heaters . . . the already famous Herman Nelson line offers industry a complete range of models. Our Vertical and Horizontal Units, for operation with either steam or hot water, are available in a wide variety of sizes. These heaters are providing an economical solution to heating problems in thousands of industrial, commercial and institutional buildings where steam or hot water facilities are already available. They provide instant heat . . . *where* and *when* it is needed and *without waste!*

AAF

herman nelson

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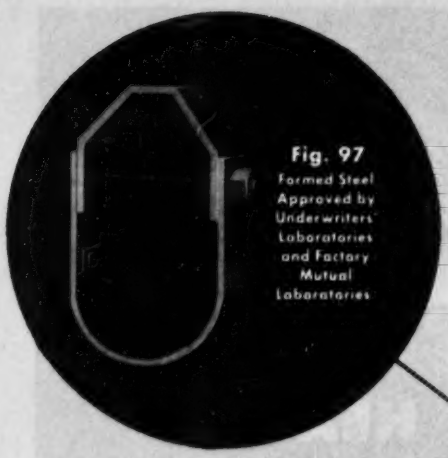

Fig. 97
Formed Steel
Approved by
Underwriters'
Laboratories
and Factory
Mutual
Laboratories

Fig. 352
Malleable Iron
Approved by
Underwriters'
Laboratories and
Factory Mutual
Laboratories

Fig. 392
Malleable Iron
Adjustable,
I Beam Flange

DOUBLE CHECK
the time cost of
assembling pipe
hangers with the pipe.

GRABLER
Square "Gee" Pipe Hangers

GIVE RELIEF FROM TIME-WASTING GRIEF

Fig. 315
Malleable Iron Approved by
Underwriters' Laboratories
and Factory
Mutual Laboratories.

Fig. 317
Malleable Iron

Fig. 65
Malleable Iron.

Fig. 103
Cast Iron Roller
Malleable Socket

Pipe hangers can be time-cost saving tools! A double check of time-cost records where Square "Gee" Pipe Hangers were used will reveal time-cost savings. Designed and fabricated to comply with modern engineering and construction practices, Grabler Square "Gee" Pipe Hangers truly give relief from time-wasting grief. Grabler Pipe Hanger Catalog J illustrates and lists many types. Ask your wholesaler for Grabler Square "Gee" Pipe Hangers.

THE SQUARE "GEE" LINE INCLUDES:
Malleable Fittings, P.A.R Fittings, Unions, Rail Fittings, Cast Iron Steam Fittings, Cast Iron Drainage Fittings, Patented Drainage Fittings, Copper Tube Solder-Joint Fittings, Cast Brass Solder-Joint Drainage Fittings, Steel Pipe Nipples, Hangers.

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"The Future sure looks *radiant*...

since we have *invisible* heating in our new development!"

Yes, real estate men, along with architects, engineers and plumbing and heating contractors, know that *radiant heated* properties are easier to rent and sell, command a maximum figure, reduce tenant and owner turnover, and minimize maintenance, cleaning and decorating costs.

Looking at it from *either* the owners' or tenants' side, it's easy to understand. Uniformly comfortable heat with no hot or cold spots, warm, draft-free floors to protect the health of the family, cleaner air, complete freedom of decoration from unobstructed wall and floor space . . . all add up to good reasons for mutual satisfaction.

Investment-wise, too, *steel pipe* encourages the use of popular radiant panel heating, in one or hundreds of dwellings. For in this single heat transmission medium is blended the advantages of economy, formability, weldability, and durability . . . all backed up by more than 60 years of *proved* performance in conventional hot water and steam heating applications.

That's why, for radiant panel heating, snow melting and other applications *steel* is the most widely used *pipe* in the world!

★ ★ ★

A free 48 page color booklet, "Radiant Panel Heating with Steel Pipe", is still available. A new, free companion booklet, "Snow Melting and Ice Removal Systems" is also ready! Ask for one or both, without obligation.

Steel Pipe is First Choice

COMMITTEE ON STEEL PIPE RESEARCH

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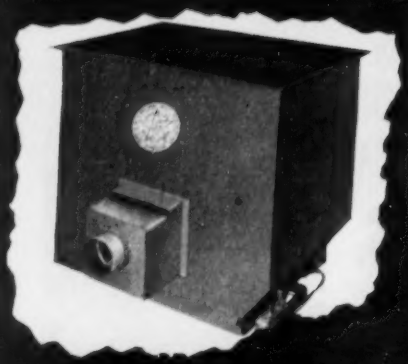
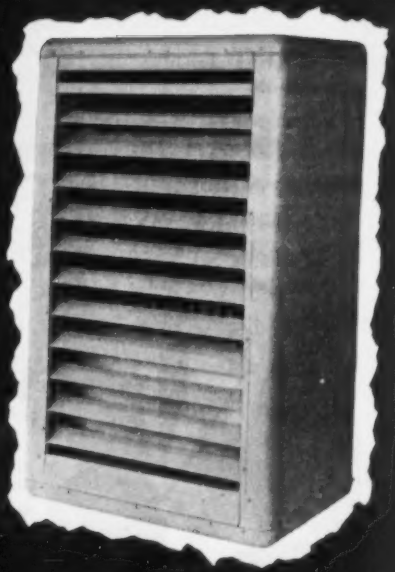
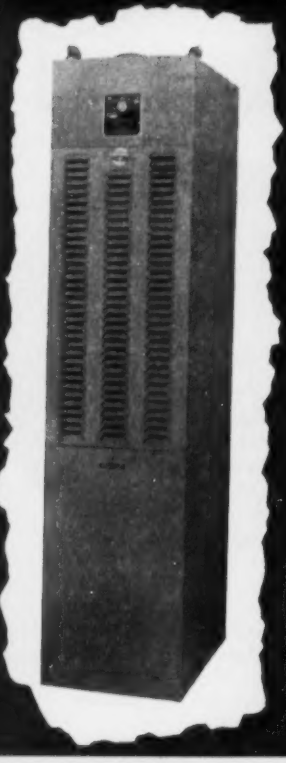
A John Zink Heat Maker for Any DOMESTIC INSTALLATION

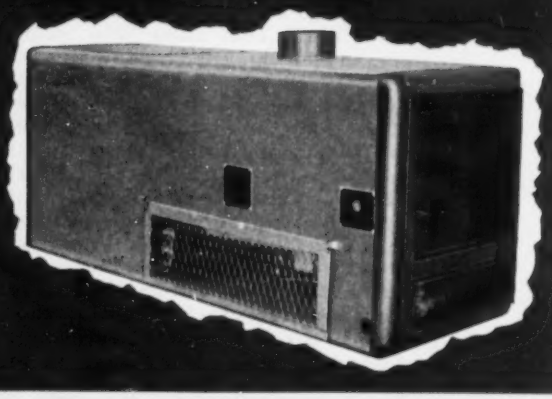


UNIT HEATER
Series UHS Fan Type





Central GAS HEATERS



JOHN ZINK COMPANY

"SKIL Tools need least maintenance . . . prove most dependable, adaptable to custom work!"

says **Richard E. Walsh,** owner,
Thomas Finn Co., St. Paul, Minn.

Mr. Walsh, head of this 55-year-old sheet metal firm, is past president of the National Association of Sheet Metal Contractors, and now president of the Sheet Metal and Roofing Contractors Association of Minnesota. He says, "All of our work is custom made. We must have dependable, adaptable tools. We have used SKIL tools for over 20 years with finest results. Not only do they give us adaptability, but the local SKIL factory branch gives us a hand with production problems, helps us save a great deal of time and labor.

"We have a SKIL Disc Sander, Driver, Drill and Hacksaw attachment. These tools require almost no maintenance or repair."

SKIL Disc Sander Model 11 is used here by Louis Mosner to sand a light housing for a wrecker truck. He says, "This sander is by far the best! It's the *one* sander I have used that gives a precision sanding job. It handles *perfectly* with the right power and balance!"

SKIL 7" Disc Sander—Model 11

Heavy duty. Ideal for removing weld marks on sheet metal; for auto body, truck and tank repair work; for cleaning concrete forms. Also suitable for many wire brushing and grinding operations. Disc diameter: 7". No-load speed: 4200 r.p.m. Overall length: 16¾". Net weight 11¾ lbs.

SKIL Hacksaw Attachment

For all portable drills of 1800 to 3500 r.p.m. Converts drill for fast sawing or filing; uses standard or broken lengths of hacksaw blades. Supplied with blade and file holders, hex key, drive pin adapter, steel cutting blade.

SKIL
PORTABLE TOOLS

Made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario

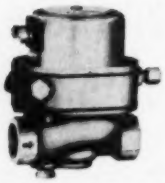
•

34 Factory Branch Offices

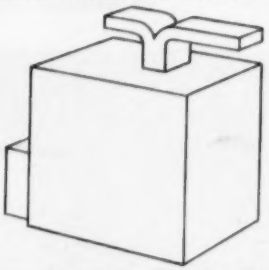
SEE YOUR DISTRIBUTOR FOR COMPLETE INFORMATION OR CALL YOUR NEARBY SKIL FACTORY BRANCH

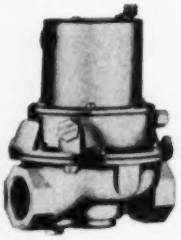
Electric diaphragm valve **FLEXIBILITY**

. . . in application . . . in product

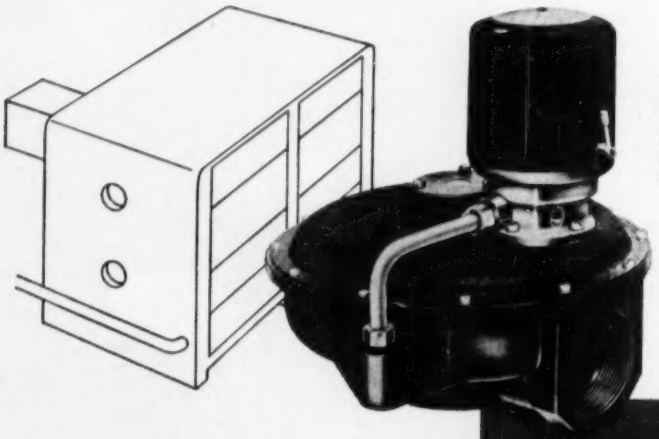


For small gas appliances: General Controls' ⅜" or ½" 24v., B-50A valve. Gives silent operation. FM approved without manual opening device or electric trip.





For central heating systems: General Controls' B-50C 24v valve with manual opening device and electric trip. Offers both high gas capacity, silent operation.



For commercial applications: General Controls' 2"-2½"-3" standard B-50D valve for line voltage or 24v systems. Simplified . . . packless . . . closes on current failure.

For wide application flexibility in automatic control of gas-fired heating equipment, take advantage of the broad range of gas capacities, pipe sizes and control characteristics found in General Controls' electric diaphragm valves. Designated the B-50 series, these reliable trouble-free gas valves are available in a full range from ⅜" to 3" ips . . . with or without manual opening device . . . with or without electric trip. Remember, for the best in control flexibility it's General Controls.

General Controls

B-50

Electric Gas Valves

GENERAL CONTROLS

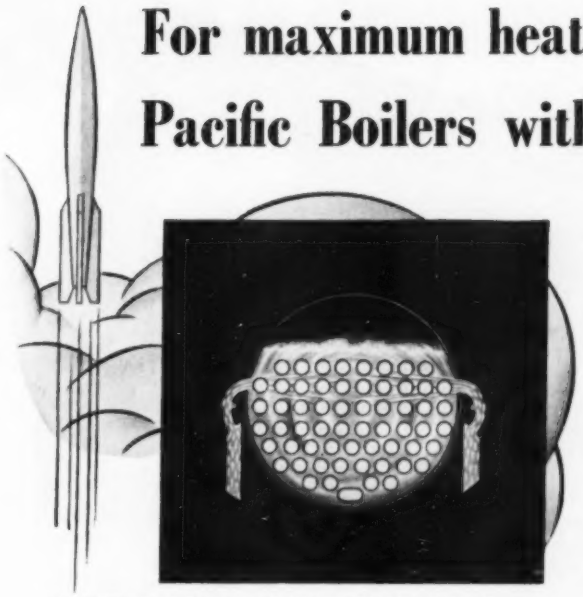
Glendale, California • Skokie, Illinois

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

FACTORY BRANCHES IN 34 PRINCIPAL CITIES

See your classified telephone directory.

For maximum heat transfer...
Pacific Boilers with Jet-action Circulation!



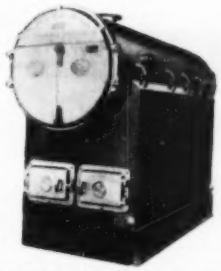
Jet-action Circulation is created by Pacific Circulating Connections. Their special design forms hot water and steam from the water leg into a jet stream trained directly on heating tubes. Insulating steam bubbles on the tubes are swept into motion producing a state of turbulence that provides maximum heat transfer.

Higher efficiency, lower maintenance costs, longer life—you get them *all* when you specify Pacific Boilers with Jet-action Circulation!

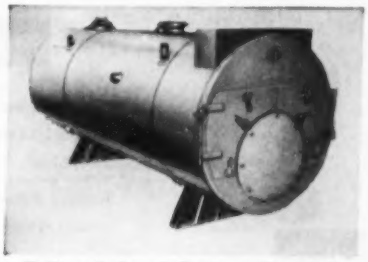
Jet-action Circulation, available in most types of Pacific Commercial Boilers, creates maximum heat transfer. It sweeps insulating steam bubbles away from heating tubes, keeps your entire boiler system at high turbulence. As a result, your installations use fuel more efficiently, respond at high speed when temperature changes are needed.

Pacific Boilers with Jet-action Circulation meet all ASME and SBI requirements. Built entirely of flange-quality steel, they're electrically welded for greater strength and safety. All, except Scotch Marine, are available in three types of construction: one-piece, with solid Circulating Connections; two-piece, with removable shell; three-piece, with split firebox.

Get complete information . . . call your local Pacific representative, or send coupon today!

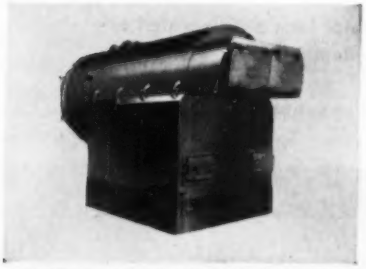


Pacific High Firebox Boilers are furnished with steel bases or with steel bearing angles welded to the firebox for erection on brick settings.



Built entirely of flange-quality steel, **Pacific Scotch Marine Boilers** feature extra-large combustion chamber, lower water line and flush-front design.

Component parts of **Pacific Split Firebox Boilers** are small enough to pass through skylight, window or doorway. Available in all types but Scotch Marine.



Pacific Front Smoke Outlet Boilers come in oil-, gas-, stoker- or hand-fired models. Built, inspected and tested under supervision of leading insurance company.

Pacific Plate Five Residential Boilers are built of flange-quality boiler plate. Exclusive Pacific design assures long life and trouble-free service.

If your job takes a **special design** your Pacific representative is always ready with needed engineering help. Send the coupon for further information!

Designed Constructed and Stamped in Accordance with ASME Code

SBI

Pacific Steel Boiler

DIVISION • UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES: DETROIT 31, MICHIGAN

Send for free Catalog!

Pacific Steel Boiler Division **Dept. HP-853**
United States Radiator Corporation
Detroit 31, Michigan

Send free Pacific Steel Boiler Catalog AP-237 to

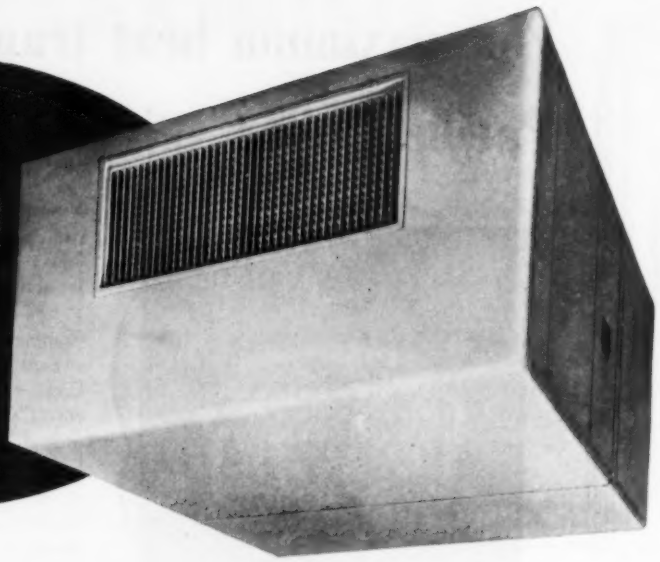
Name _____ Title _____

Company _____

Address _____

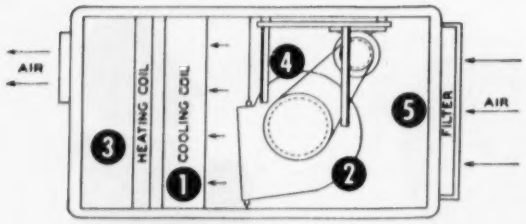
City _____ State _____

NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



(1) MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

(2) "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

(3) ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

(4) QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

(5) FOR FINISHED INTERIORS

Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

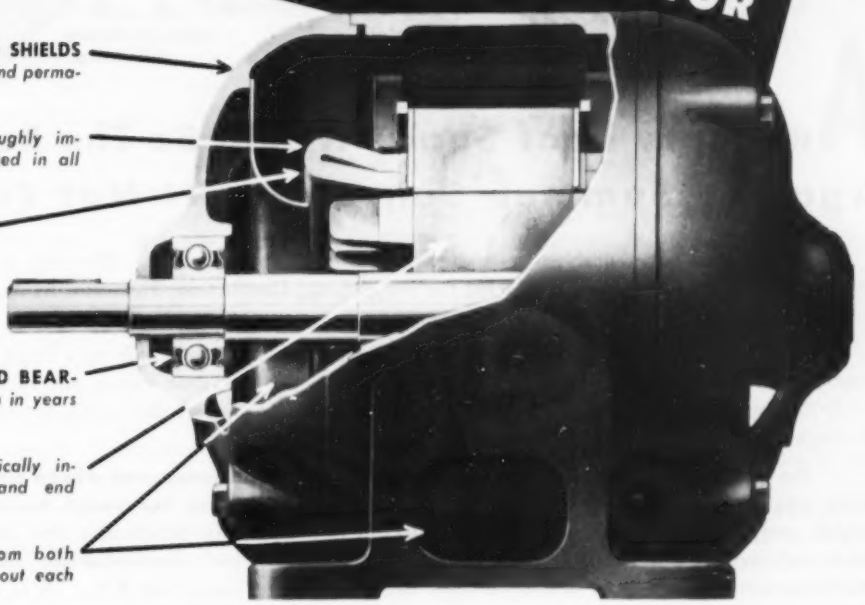
MANY OTHER OUTSTANDING FEATURES.

WRITE FOR BULLETIN AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

Reliable?— well, check these features in the...

ELLIOTT SQUIRREL-CAGE INDUCTION MOTOR



RIGID GRAY IRON END SHIELDS *for solid bearing support and permanent alignment.*

VINYLASTIC WIRE *thoroughly impregnated and baked, used in all stators.*

CORDED END TURNS *for strength and permanence and phase-to-phase insulation to give further assurance of long life.*

SEALED PRELUBRICATED BEARINGS *needing no attention in years of service.*

ALUCAST ROTORS *practically indestructible — bars, fans and end rings are one solid piece.*

DUAL VENTILATION *from both ends of rotor, discharged out each side of the frame.*

Isn't this what you want in a good general-purpose motor —one that will require no babying nor special attention while in service on machine tool, process apparatus, fan, blower or pump? Here is sound dependability based upon solidly established past performance in applications of all kinds. Here is a motor that has passed every service test, thousands of them, tough as they come.

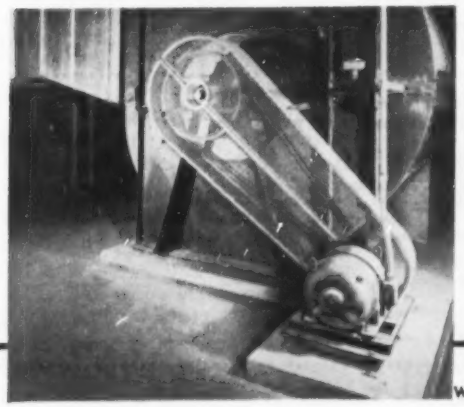
Another thing—this motor with all its rugged qualities, is available in all standard mountings—horizontal C face mounting, frame with feet — vertical flange mounting, with built-in C-W brake, in open drip-proof or splash-proof enclosure. In NEMA frames 203 through 505.

Put this Elliott Crocker-Wheeler motor wherever you want it, and say good-bye to motor troubles.

For full data on this and other Elliott C-W motors, contact your local Elliott field engineer or write Elliott Company, Jeannette, Pa.

RIGHT FOR AIR CONDITIONING

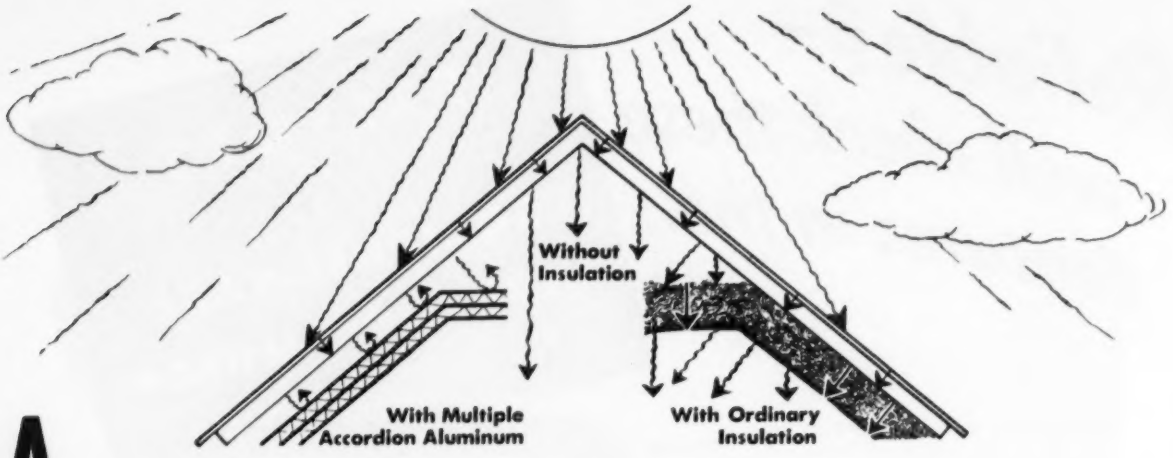
Here is one of 95 of these C-W motors in a new air-conditioned skyscraper. This one of 15 hp, drives a big return fan.



W3-2

ELLIOTT Company

CROCKER-WHEELER DIVISION



An Empty Roof Space Would Be The Best Insulation Against Summer Sun, *Were It Not For Radiation*

Convection is not a problem — there is no Convection downward. The only heat flow in summer through an empty roof space is Radiation, except for insignificant Conduction. Heat flow by conduction through roof spaces — through any building air space — is abut 5%.

Ordinary insulation may retard heat for two or three hours, but builds up a large heat storage as compared to empty space. Fairly solid, it is a much better conductor of heat than empty air. Its surfaces absorb more than 90% heat rays. Some heat passes through it by conduction, and is then radiated into the rooms at a 90% rate through the day and sometimes into the night.

The solution is to use a material which has little substance and whose surfaces will not absorb nor emit appreciable radiation. Silver foil would be excellent but tough multiple accordion aluminum, which weighs but ¼ oz. a sq. ft., is inexpensive and has practically the same heat-ray absorption and emissivity (2% more). It absorbs only 3% of the preponderant radiant heat flow through building air spaces inside walls, ceilings and roofs, and emits but 3%. It is practically non-condensation forming and impervious to vapor. Its multiple air spaces virtually eliminate conduction. The commercial form is Infra Type 6 and 4.

The National Bureau of Standards Booklet BMS52, "Effect of Ceiling Insulation upon Summer Comfort," lists on page 10, the "insulations tested" in the order of decreasing effectiveness in protecting the ceiling against summer heat, as follows:

"1) Two layers aluminum foil (both sides of each layer reflecting).
"2) Full thick (3⅝") rockwool."

Try this test: Tack or scotch-tape 3 sq. ft. of multiple accordion aluminum (we will send it free on request) to the underside of a hot roof or ceiling, whether uninsulated, or insulated with ordinary insulation. Step in and out of the protected area beneath. The difference will be so marked, you will need no thermometer.

There is now a new standard Infra Insulation (the commercial form of multiple accordion aluminum) improved to form a "blanket" of *uniform* depth between studs and joists which completely covers the spaces between.

COST OF THE *NEW INFRA INSULATION INSTALLED
In new construction between wood joists, material with labor,

Type 6-5*i* **under 9½c sq. ft.**

Type 4-5*i* **under 7½c sq. ft.**

Type 4-5 Jr. under 7½c sq. ft.
***Patent Applied for**

INFRA INSULATION, INC.
525 Broadway, N.Y., N.Y. Dept. (H-8)

Please send FREE:

☐ Bureau of Standards Booklet BMS52 "Effect of Ceiling Insulation upon Summer Comfort."
☐ 3 Ft. Square of Multiple Accordion Aluminum for Test
☐ Infra Price List

Name .....
Firm .....
Address .....

INFRA INSULATION, INC., 525 Broadway, New York, N. Y.

THE EDITOR'S PAGES

PARTS OF THE country are blessed with better climate than others, sometimes tend to have the feeling that air conditioning may not be an essential but just a luxury. However, air conditions aren't the same inside a building as outside — and even a "good climate" can have its heat waves. . . . . While it's far from being the only air conditioning installation in Denver, it's interesting to note that the new "Mile High Center," 23 story building now under construction there, is to be completely air conditioned.

New Motor Standards Announced by Electrical Manufacturers

NEW STANDARDS allowing more horsepower to a frame size for all of the popular high production alternating current type electric motors from 1 to 30 hp were announced last month by C. O. Hedges, chairman of the motor and generator section of the National Electrical Manufacturers Association, 155 E. 44th St., New York 17.

He cited the advent of superior synthetic insulating materials, new and better silicon steels and improved techniques — as well as real advances in the art of motor design — as developments which permit packing more horsepower into electric motors for a given size and space.

"The new motors," Mr. Hedges declared, "will continue to satisfy fully the same performance standards of torque, temperature rise and starting current limitation as before. These standards, while using a fewer number of frame sizes to cover this range of horsepowers, retain the previous frame numbering system.

"Complete data on derivatives, types of mountings, etc., are now available as a result of the section's approval of its committee work. Frame assignments have been made to cover the 2- through 12-pole speed ratings for the open and totally enclosed, fan cooled types.

"As in the past, the standards have been laid out to afford maximum interchangeability between the totally enclosed, fan cooled ratings and the open type ratings by utilizing the same horsepower-frame relationship as far as possible," he said.

"In this re-rating program," he continued, "for a while there will be some users of electric motors who will have to stock additional renewal parts and, perhaps, additional spare motors during the transition period. But, more horsepower for a given size, lower space and storage costs, more economical mounting platforms, and easier installation and maintenance are advantages of the change-over which will shortly outweigh all other considerations.

"For the electric motor manufacturers," he said, "the new standards, for the first time in 25 years, offer an opportunity to make full use of new techniques and technological advances. However, the new program, for them, involves a substantial amount of engineering, development, testing and re-training of factory personnel, as well as changes in production facilities and techniques. Therefore, it is estimated that the first of the new motors should become generally available early in 1954. Naturally, each company will determine and announce when its motors, built to the new standards, will be ready."

First-Half Construction Sets All-Time Record

THE CONSTRUCTION boom in the 37 states east of the Rockies continued to drive toward a 1953 all-time record in contracts awarded as five month totals gave the current year an 8 percent edge over 1952, it has been reported by F. W. Dodge Corp. The five-month 1953 figure was $6,792,329,000.

Nonresidential building for five months showed the greatest increase over 1952 with a $2,492,801,000 total, up 16 percent.

The expected midyear decline arrived in June, with awards 19 percent below June 1952.

Expenditures for new construction were at the highest level in history during the first half of 1953, according to preliminary estimates of the U. S. Labor Department's Bureau of Labor Statistics and the Building Materials Division of the U. S. Department of Commerce. Each month this year, spending for new construction has reached peak levels, and by the end of June totaled $16 billion—almost 8 percent above the January-June 1952 total.

The only significant declines from a year ago occurred in hospital building (private and public) and in public housing.

Even after adjustment for price changes, new construction activity in the first half of 1953 was at an all-time high.

"Most Air Conditioned Ship" Nears Completion

ONE OF THE WORLD'S "most air conditioned ships" is the Swedish-American Line's new M. S. Kungsholm. The maiden voyage of the 22,000 ton luxury passenger liner across the Atlantic to New York is set for late November.

The air conditioning system which will move warm air through the ship during the winter as well as provide cool, dehumidified air in summertime, is much more extensive than is usually found on big passenger vessels, according to Carrier Corp. The entire passenger accommodations, living quarters for officers and crew and a large area of the service spaces are conditioned. While the public rooms will be regulated by a central plant system, the passenger cabins offer individual control of temperature.

The entire air conditioning and ventilation plant has a total air handling capacity of 350,000 cfm. Two refrigerating plants, including one for the refrigerated cargo space and

"Quote"

"If you can keep your head when all about you are losing theirs, then maybe you don't understand the situation."—*From "The Oregon Diffuser", quoting from an unknown source.*

provision store rooms, have a cooling capacity of 650 tons.

Officers and enlisted men stationed aboard capital ships of the U.S. Navy soon will have their living quarters completely air conditioned if the present trend continues, S. W. Brown, chief engineer of Carrier's marine department, told a recent meeting of naval reservists.

He said air conditioning of naval warships before and during World War II included only such vital spaces as radar, communications and ammunition rooms, as well as aircraft carrier ready rooms and hospital operating rooms.

"Within the last five years, however," he said, "air conditioning applications aboard naval warships have been considerably more extensive, following a series of successful tests conducted by the Navy's Bureau of Medicine and Surgery.

"Wartime experience in tropical waters, the Bureau revealed, proved that the crew in a completely air conditioned warship — living quarters included — would have a distinct and perhaps decisive advantage in action with an enemy fatigued and of lower alertness from living aboard a hot ship."

J. S. Kearney Heads Chicago Contractors

J. S. KEARNEY has been elected president of the Heating, Piping and Air Conditioning Contractors' Chicago Association, succeeding Charles E. Crone. Frank Bellis is the new vice president of the group. C. W. Johnson remains treasurer, and Thomas Kelly continues as secretary. T. M. Cunningham is the executive secretary.

At the association's 65th annual dinner, held in the Bismarck hotel's air conditioned Walnut room, Guy Kiddoo, a vice president of the First National bank, stressed that — to avoid troubles — contractors must have adequate cost control when expanding, must be familiar with local union rules, must realize that jobs don't run themselves, and must be sure that the scope of the work is clearly defined in the contract.

Mr. Crone was presented with a diamond ring and a certificate in appreciation of his services to the association.

"Quote"

"Remember, there is always a better and easier way. Look for it, find it, use it . . . and you will work smarter, not harder."—*S. F. Kaplin, General Electric Co., in a paper on cost reduction through standardization of engineering forms and procedures.*

March of Progress Brings New Problems

THE INEVITABLE forward march of progress also brings new problems to mankind.

In Brooklyn, a squabble about how much noise a bedroom air conditioner does or doesn't make came to court.

The magistrate made what we feel to be a wise observation. He said that the fellow who doesn't have an air conditioned bedroom gets that much hotter when he realizes he is suffering and his neighbor is comfortably cool.

Gas Sales Gain, AGA Reports

SALES OF THE gas utility industry to ultimate customers during May totaled 4286 million therms, a gain of 16.5 percent over the same month a year ago, according to the American Gas Association. For the 12 months ended May 31, 1953, utility gas sales totaled 54,375 million therms, an increase of 8.8 percent over the previous cumulative period.

Store Gets Economical Cooling

WE WALKED through wide-open doorways into the Greeley (Colo.) Dry Goods Co.'s attractive department store during a recent heat wave and found it delightfully cool and comfortable. We wondered why the cost of air conditioning wasn't excessive with the outdoor temperature way up in the 90's and all the doors opened.

It turned out that a well just a few feet deep supplies around 200 gpm of water in the low 50's. A fan, cooling coil, pump and ducts were installed 15 years ago for around $5000 and the store has been air conditioned ever since. The electrical cost amounts to "practically nothing" each month.

The outdoor humidity is quite low in Greeley. In fact, on one occasion when it ran higher than usual, everyone thought the coil was leaking until it was realized the water was actually condensation of the moisture in the air.

The manager said he wouldn't be without air conditioning — even at more "normal" costs.

Gas Industry To Spend $4 Billion for Construction

THE GAS UTILITY and pipe line industry will spend almost $4 billion for construction of new facilities and expansion of present plant during the four years from 1953 through 1956, the American Gas Association reports. This compares with construction expenditures of about $4.7 billion in the four years 1949-1952. (The association's estimates presently cover a four-year period to coordinate with other AGA studies).

About $1.9 billion of the proposed expenditure will be spent on transmission facilities and $1.4 billion will go for distribution expenditures. The remaining $637 million of the total is to be spent for production, underground storage and general facilities.

Cites Advantages of Modernizing With A.C.

IN ANNOUNCING modernization of the 41 year old skyscraper at 80 Maiden Lane, a well-known address in New York's financial district, the owner, the American Eagle Fire Insurance Co., said that the advantages of the program would equal those obtained in moving to a completely new building, without the disadvantages involved in the transfer from a familiar, recognized address to a new location. The costs of modernization will also be much less than for construction of a new building.

American Eagle said:

"We feel that the efficiency and productivity of the staff will be increased by air conditioning, and there should be no enforced shutdowns in hot weather. Air conditioning also should reduce house cleaning costs.

"Modernization with air conditioning and engineered lighting will also provide better space utilization."

The entire building will be air conditioned, including three cafeterias and a recreation area for employees, it is reported by the Carrier Corp.

Charm of a Country Inn

Living room at Oak Haven Inn, near Easton, Md., on the famed "eastern shore." 4-zone Webster Baseboard Heating system installed in 1951.

Comfort of Webster Baseboard Heating

Obsolete 30-year old hot air heating system replaced by Forced Hot Water Webster Baseboard Heating during the heating season without interfering with guests.

Oak Haven Inn near Easton, Md., was once a private home. Then the Berkeley Brandts fell in love with it and with the famed "eastern shore" of Chesapeake Bay. Without sacrificing the unusual charm of the home, the Brandts changed it into a year-round vacation retreat.

"In 1951, we decided to replace the obsolete 30-year old gravity hot air system at Oak Haven Inn," Mr. Brandt said. "We decided on Webster Baseboard Heating because we wanted to get the heating system out of sight as well as out of mind. Formerly, some of the rooms were never warm enough for guests. We also wanted cleaner heat.

"The change-over was made during the heating season without inconvenience to any guests. C. Albert Matthews, well known Easton contractor, had his men work room by room during the day and clean up to permit occupancy of the rooms at night.

"With Webster Baseboard Heating, guests are comfortable without the feeling or smell of heat. It spreads the heat evenly all around the perimeter of the building. It's clean heat, too. We know that we have saved on cleaning costs because there are no fast-rising currents of heated air to soil draperies."

Webster Baseboard Heating is zoned to permit shut-off of sections of the Inn not in use. There is no exposed piping anywhere.

If you want to go after profitable modernization business with Webster Baseboard Heating, call the Webster Representative. Or write us for his name.

Address Dept. HP-8

WARREN WEBSTER & COMPANY

Camden 5, New Jersey : : Representatives in Principal Cities

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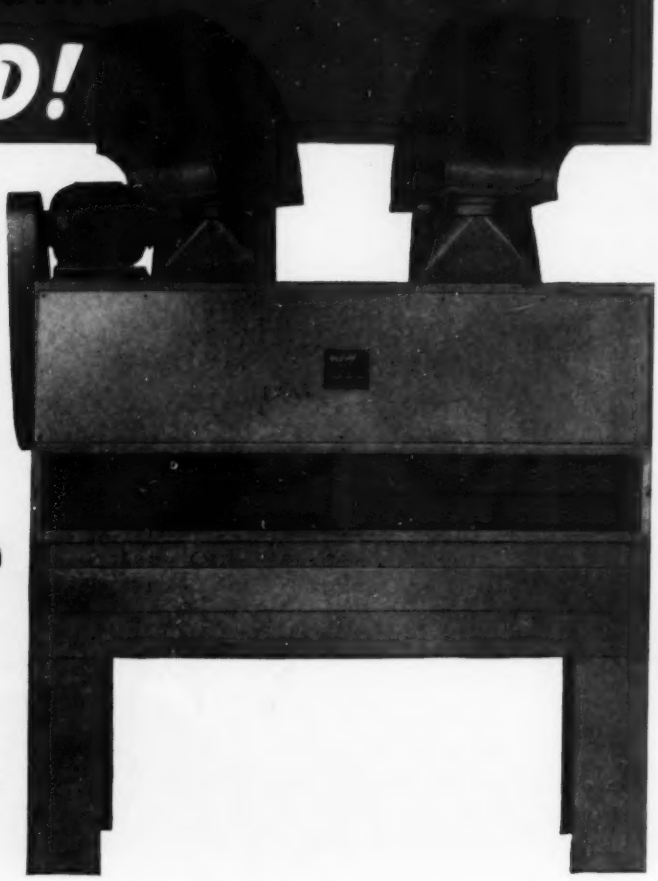

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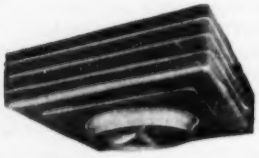

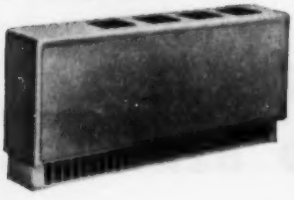

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Webster

"OPEN FOR DISCUSSION"

WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

CARL B. ROWE —

"New Code Is Evidence of Real Progress"

IT IS EVIDENCE OF real progress to see that firms representing the bulk of the manufactured volume of panel type air filters have finally reached an agreement on standardized methods and equipment to be used in rating panel type filters. The complete lack of uniformity in test methods, equipment and dust which are in current use makes it extremely difficult to compare the performance of the various products which are available. Adoption and use of the new AFI code described in the June HPAC should be a great step forward in easing the problem of comparing the performance of the various types of air filters which are available.

It is my opinion that the strong points of the new code are the use of a vertical test duct, and basing the test results on the entire volume of test air rather than sampling a small percentage of the test air volume.

When horizontal test ducts are used, appreciable quantities of the heavier components of the test dust can settle out before they reach the test filter position. The quantity which settles out varies both with the type of test dust which is used and with changes in air flow velocity. This both alters the composition of the test dust and complicates the problem of accounting for all of the test dust. The use of a vertical test duct eliminates these problems.

When a partial sampling system is used, the problem of obtaining a small sample which is truly representative of the entire test air volume becomes very complex. Also, when a partial sampling system is used, it is essential that the concentration of airborne test dust across the cross section of the test duct be held uniform within very close tolerances. Also, the velocity of the test air stream must be held to a close degree of uniformity across the cross section of the test duct. The use of the absolute filter essentially bypasses most of the problems involved in partial sampling.

I believe that the selection of a weight method for rating panel type filters can be justified both on the basis of simplicity and on the basis of the recognized limitations of most panel type filters. It is generally recognized that panel type filters are most effective in arresting the larger of the airborne particles. They are not particularly effective on such airborne particles as smoke and on the particles in the sub-micron size of the particle size spectrum. In arresting the coarser dust particles, factors such as the rate of resistance rise as the filter collects dust are just as important in evaluating the overall performance of the filter as is the arrestance efficiency. A weight test method is readily adapted to obtaining data when collecting the larger particle sizes, and the data obtained is very easily interpreted.

The new AFI code recognizes that devices such as the electronic precipitator can probably be rated to better advantage by some method such as the discoloration method. A second section to the code is to be developed to cover the rating of such devices.

The composition of the test dust which has been selected can justifiably be criticized on the basis that the dust is not representative of the dust which the filter is likely to be called on to arrest when it is installed in its working application. However, there are so many variations in the compositions of airborne dust loads that it would be impossible to select any one dust which would be representative of any dust which the filter might be called on to arrest. It is my opinion that the only practical way to obtain laboratory ratings on panel type filters is to make use of an artificial test dust. If an artificial test dust must be used, there is no course other than to select the best test dust which is now available. Some authorities believe that methods of producing ideal dusts — having most all of the desired properties — are close at hand. If this proves to be true, I think that the AFI code can be improved by adopting the improved test dusts as they are developed.

An apparatus of very similar design to the one described in the AFI's new air filter code has been in use by me for several years. Results obtained on the apparatus show good reproducibility. The equipment is easily operated and maintained. In making full scale tests, the results have shown a good dust balance check without making use of the aluminum foil strips called for on the AFI type of absolute filter. This is perhaps due to the effect of the test filter reducing the quantity of dust which reaches the vicinity of the absolute filter, thus reducing the quantity of dust which might be caused to precipitate out on the walls of the duct in the vicinity of the absolute filter.—CARL B. ROWE, Research Products Corp.

W. T. VAN ORMAN —

"We Need More Rigorous Air Filter Tests"

WE APPRECIATE the opportunity of commenting on the Air Filter Institute's new air filter code, discussed in the article by A. Nutting and R. F. Logsdon in the June HPAC.

We agree with the authors' perspective on carbon black: "The carbon represents the free carbon existing in the atmosphere, is one of the most damaging materials in ventilating air supplies and is one that is most important to remove."

Further in the article we find the statement that "carbon black contributes to lower arrestance values but is difficult to disperse alone."

In conclusion, we note the statement: "The mixture (carbon black, Arizona road dust and lint), taken together, is an excellent synthetic dust for air filter performance tests for it is readily dispersed."

The inference from these statements is that the dispersion of carbon black in the air stream is very simply handled by mixing it with the Arizona road dust and lint — and

then, in this mixture, it is readily dispersed.

Our experience has shown that the problem of dispersion of carbon black is not so easily handled. In the air it has tremendous flotation power due to its low gravity, and characteristic structure and small particle size. In the mixture described in the AFI test we find the very antithesis of this condition, where the carbon black tends to adhere to the particles of Arizona road test dust, making these particles larger in size and more easily captured.

We need more rigorous tests instead of easier ones. It is a far cry from the median particle size of atmospheric dust of 0.97 microns to the average particle size of the AFI test dust, which is certainly not representative of atmospheric dust. We, therefore, wish to emphasize the carbon in this test dust is not at all representative of the carbonaceous material present in the atmosphere.

More progress can be made in the art of cleaning air by giving special attention to the capture of the finer particles than can be made by devising new codes which are not appreciably better than previous codes. Instead of realistic values for efficiency with the new AFI code, we end up with mere numerical answers which bear no direct relation to the performance of the filter in removing carbonaceous matter from the air.

To summarize our evaluation of the AFI's new air filter code, we are sorry to state that it does not represent — in our opinion — an improvement in the art of testing filters or help in the art of cleaning air, and the net result of this code will only be additional confusion.—W. T. Van Orman, In Charge of Air Filter Research, Goodyear Tire & Rubber Co.

A. E. DeSOMMA —

"Base Efficiency on Both Weight, Particle Size"

As a comparative basis of evaluation of impingement and strainer type filters to serve the consumer who is not particularly concerned with efficiencies at various particle sizes, dust loadings and other factors, the code as proposed by the Air Filter Institute seems adequate for the average purchaser.

However, the code is definitely lacking in that it does not recognize or give proper weight to filters that do an equally good job on fine particles as another may do on the larger particles. Perhaps a factor of efficiency based on both accumulated dust by weight and also by micron size would be a satisfactory compromise to all concerned.—A. E. DeSomma, Senior Engineer, Code 549, Bureau of Ships, Navy Dept.

[The authors' replies to these remarks will be published next month. Other comment on the code appeared in the July HPAC.]

GEORGE D. LAIN —

"Proper Fill Under Snow Melting Piping Essential"

The article by W. A. Connor in the Question of the Month columns in the June HPAC — on precautions to be followed in snow melting and radiant heating piping installations to guard against corrosion — is interesting.

The use of a 6 to 8 in. stone fill that is properly drained is considered essential. We regard proper testing as a vital part of good construction and advise that the pipe be completely embedded in the concrete.

In the case histories cited by Mr. Connor, there is no indication that the pipe had been completely embedded in the concrete. In case 1, the pipe appears to have been placed on crushed stone; in case 2 on sand. In case 4, it was reported that some of the pipe was flush with the top surface and consequently not properly embedded; and in case 5, the pipe appears to have been laid on the crushed stone. In this latter case, corrosion was reported as slight and it is my opinion that if the pipe had been completely embedded in the proper concrete with at least 2 in. of good concrete around the pipe the corrosive action would have been negligible and the system capable of many years of service.

In those cases where ground water conditions are such that the fill may become filled with water and reach the slab, a moisture barrier is advisable. These points are covered in my comments published in the May HPAC, and appear to be in line with Mr. Connor's experiences.

The unique theory developed by Mr. Connor in connection with case 1 might also be the result of sufficient moisture filling the thin layers of stone at times and getting in contact with the pipe so that better electric conduction to the ground was a factor. Complete embedment may have avoided difficulty in this case.

In reference to rule 5, as given by Mr. Connor, it is my opinion that if pipe is properly embedded in the proper concrete and the slab is laid on a well drained crushed stone fill, it is unnecessary to coat the pipe with an asphalt paint or protective coating.

It may also be helpful, in those cases where proper installation methods were not used, to know that it is possible to overcome corrosion difficulties by the use of cathodic protection. Cathodic protection should be installed under the supervision of organizations qualified to handle such work in order to get the proper service and results.—George D. Lain, Research Engineer, Committee on Steel Pipe Research, American Iron and Steel Institute.

E. K. CAMPBELL—

"Correct Installation Is Secret of Good Heating"

I was interested in reading in the May HPAC the article by Samuel R. Lewis entitled You Simply *Must* Supply Air for Combustion. The truth of that statement applies to all plants and it is well known to any engineer or contractor with experience who studies his work.

The condition he describes illustrates a fact which I have tried to state many times: The only way to get away from trouble is for the jobs to be designed and installed as they should be. That, of course, includes any necessary provision for combustion air.

Poor application has been the father of most of the troubles of the warm air furnace business.

Large furnaces for heating large spaces are coming more and more in favor. A few concerns have done good work and good engineering — but as more break into the business the troubles will begin (in my opinion). It will again become necessary for each individual concern handling heavy duty furnaces to build its own reputation for correct engineering, correct installation, and for an honest attempt to fulfill all guarantee obligations.—E. K. Campbell, President, E. K. Campbell Co.

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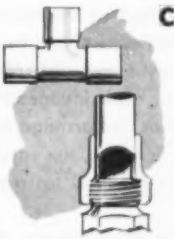
Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.



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No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

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Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.

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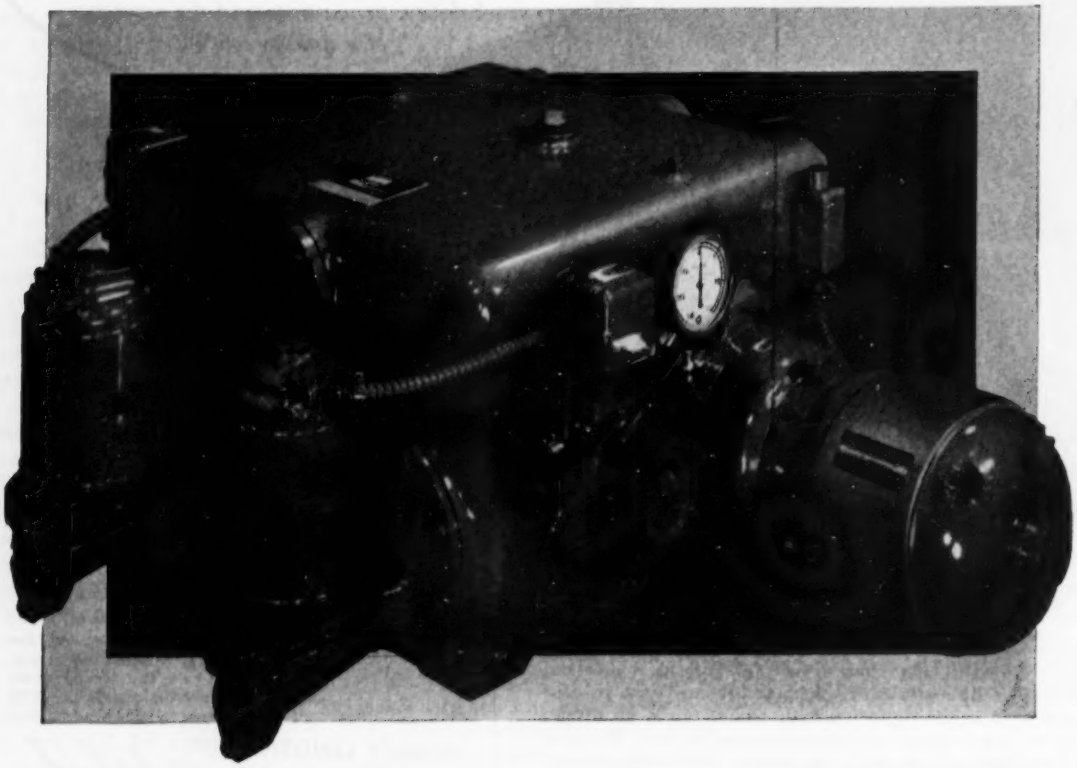

It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

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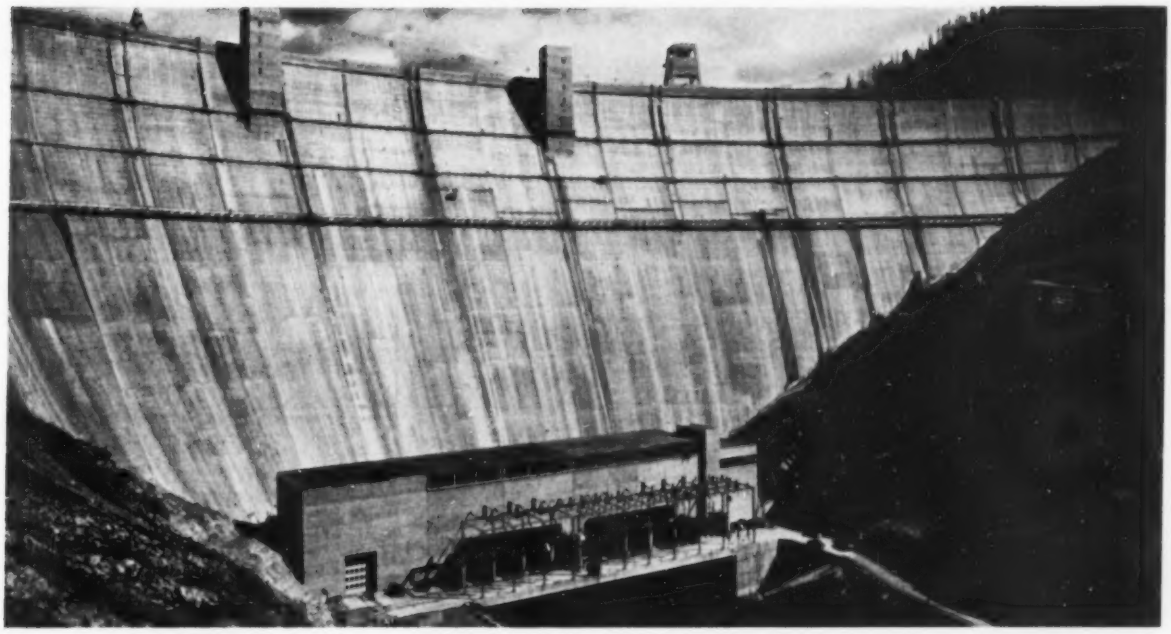


By a Dam Site

Electricity Heats, Ventilates Hungry Horse Power Plant

By L. L. DeLong
Engineer
Bureau of Reclamation

THE LARGEST ELECTRICAL heating and ventilating system to be installed in a single Bureau of Reclamation hydroelectric power plant structure has been recently completed. The installation is at the Hungry Horse power plant, a major feature of the Bureau's Hungry Horse project in northwestern Montana, which has a capacity of 285,000 kw — of which 1740 kw is used to heat the structure.

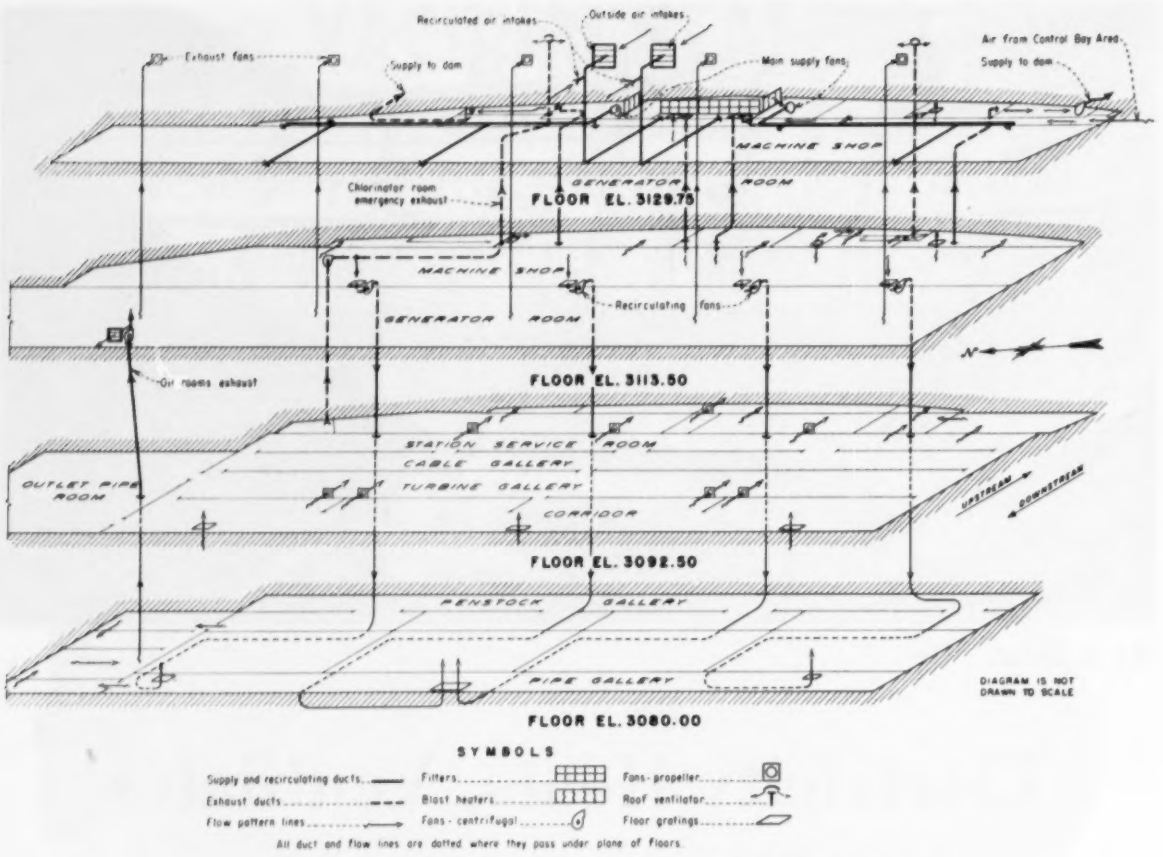
6 Million Btu per Hr

Built at the toe of Hungry Horse dam, a 564 ft high concrete structure completed last October, the power plant houses four 71,250 kw generators. The overall plant structure is 284 ft long and 125 ft wide, the generator room being 246 ft long, 76 ft wide, and 75 ft high.

Blast or duct heaters having capacities up to 160 kw are used as tempering or preheaters for the power plant. Unit heaters, with propeller or centrifugal fans, and convection heaters are used as reheaters. The generator room, with its vast area of exterior walls, is heated principally by wall mounted convection heaters. All heaters are controlled automatically by thermostats. The installed capacity of the heating equipment can liberate about 6 million Btu per hr. No mechanical cooling, humidification or dehumidification of air is provided.

The structure may be considered as having two heating and ventilating systems. One is designed to serve the control bay area and the other to meet requirements of all remaining spaces in the power plant. Outside air for the structure as a whole is introduced at a rate of one-half change per hour when heating is required and at a rate of not less than one change per hour when the outside air temperature is above 65 F. During the heating season, the volume of outside air provided exceeds the volume of air exhausted — thus tending to place the building under pressure. This reduces infiltration losses, prevents drafts and permits more accurate temperature control.

The heating requirements for the structure are based on maintaining 70 F temperatures in the control bay area and a minimum of 45 F in most other spaces in the power plant. An outside design temperature of −20 F was used in computing maximum heating loads.



AIR FLOW IN THE power plant. Grade line is at floor elevation 3113.50

Compressed cork insulation 2 in. thick is provided under the roof of the power plant structure. This insulation reduces heating requirements in the generator room and in the control bay area. Converse benefits result in the summer when solar heat gains are reduced, thus improving comfort conditions and easing demands on the air handling equipment.

The generators are completely enclosed and are provided with extended surface cooling coils which use penstock water to provide generator cooling. Heat from the exciters reduces load demands on the electric heaters in the generator room during cold weather.

Power Plant Ventilation

The two main supply fans for the power plant are centrally located in a room adjoining the dam about 30 ft above the generator room floor. Air handled by these two fans consists of varying proportions of outside air and recirculated air from within the power plant. These air quantities are varied by banks of modulating, motor operated dampers at the air intakes high on the upstream wall of the generator room.

This air mixture is drawn through two ducts, which cross under the roof of the machine shop, to a plenum chamber space where it mixes with additional recirculated air. The total quantity of air is then drawn through filters, electric blast heaters and into the fans. These fans continuously deliver a total of 65,000 cfm through a system of ductwork to the machine shop, generator room, corridor and battery room.

Most of the air delivered to the machine shop is drawn through gratings in the machine shop floor by four centrifugal fans which discharge it into the penstock gallery below the station service room. An exhaust fan withdraws part of this air through the oil rooms and discharges it through interlocked dampers either to the work area at the north end of the generator room or directly to the outside.

The remainder of the air supplied to the penstock gallery is circulated through lower levels of the power plant to the downstream pipe gallery. Floor gratings above the pipe gallery permit the air to rise to a corridor above. At this point a group of propeller fans operate continuously to direct the air toward stairways near the upstream side of the plant. The air, upon rising through these stairways into the generator room, may be recirculated by entering the motor operated damper openings above. It may be discharged naturally to the outside through open doors or windows, or mechanically by a group of four propeller fans above the crane rail on the upstream wall of the generator room.

The toilet room, locker room and battery room near the upstream side of the plant are provided with fans which operate continuously to exhaust air to the outside. The chlorinator room is equipped with a special exhaust fan for emergency use only which serves to exhaust toxic chlorine gas which may escape from water chlorinating equipment. Air contaminated by this gas is discharged

through a cement-asbestos duct directly to the outside.

Control Bay Ventilation

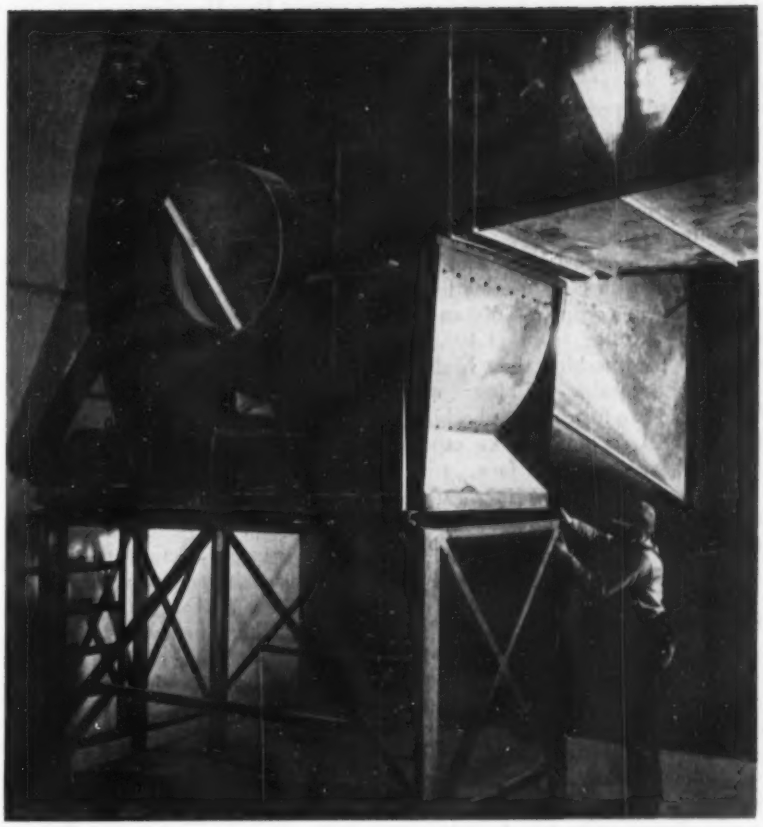
The supply and exhaust fans for the control bay area are centrally located on the top floor at the south end of the building. Outside air is continuously drawn through fixed stormproof louvers, blast heaters and filters into the supply fan. The fan discharges this air into a vertical concrete shaft from which a system of ductwork delivers it to various spaces at three levels of the control bay. Normally, most of the air then passes through door louvers and along corridors to combine with recirculated air of the power plant. As the outside air temperature rises above 60 F, an automatic louver damper in the elevator tower opens to exhaust some of this air to the outside.

An exhaust fan operates continuously to draw air from toilet rooms and other spaces at the three levels through a system of sheet metal ducts. This air then passes through a vertical concrete shaft and is discharged directly to the outside.

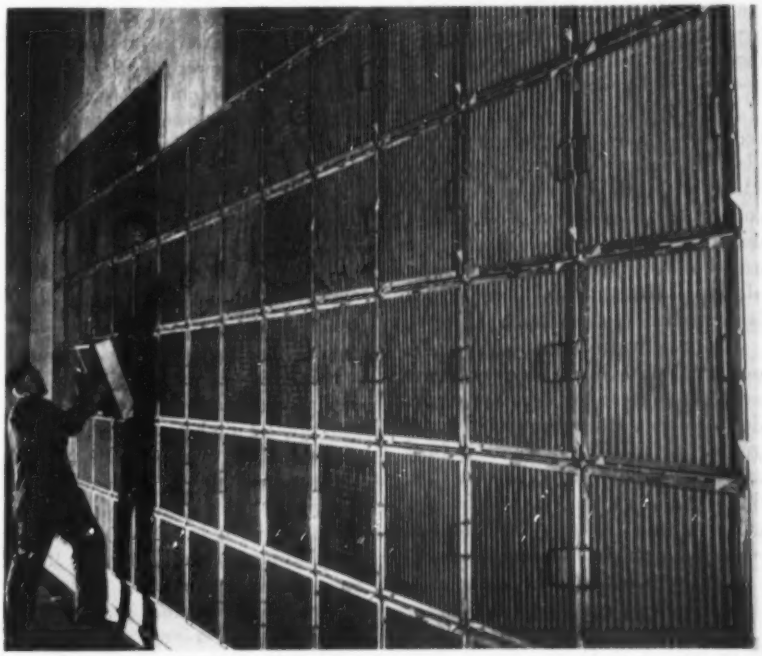
Power Plant Heating

When the outside air temperature drops to 65 F and below, the outside and recirculated air dampers at the generator room inlets for the two main supply fans start operating in order to maintain a relatively constant air mixture temperature. These dampers are controlled by a modulating type thermostat. As the outside air temperature continues to drop, the outside air damper gradually closes to its maximum closed position, admitting the established design quantity of 12,000 cfm of outside air. Further dropping of the air mixture temperature causes the modulating thermostat in the air stream near the fan inlets to begin its function. This thermostat operates a program switch with a reversible motor and adjustable cams to operate blast heaters at inlets to both main supply fans.

One blast heater has three sections of 40 kw each, and the other has three sections of 50 kw each. One section of each heater is energized when the incoming air temperature drops to 50 F. The remaining two sections of each heater are energized one for each successive 5 F drop below 50 F. The blast heaters serve as preheaters or tempering heaters.



THIS 37,000 CFM FAN is one of the two large supply fans that deliver air to the power plant. A 150 kw electric tempering heater covers the square inlet on the far face of the rear wall



BANK OF 82 AIR FILTERS viewed from downstream side. Sixty-five thousand cfm of outside and recirculated air passes through these filters before entering the power plant's two main supply fans

Their operation results in discharge air temperatures ranging from 55 F to 45 F. Heating loads in spaces served by the two main supply fans are satisfied by electric unit, cabinet or convection heaters. These heaters are placed to meet principal heat losses where they occur and are controlled by integral or wall mounted room thermostats.

The two principal spaces of the power plant with large heating loads are the machine shop (295,000 cu ft) and the generator room (1,400,000 cu ft). The machine shop heating equipment consists of four unit heaters and two floor mounted cabinet heaters. All six are of 50 kw capacity and have centrifugal fans.

Design considerations for heating the generator room indicated a need for even spreading of heat along the broad expanses of walls with outside exposure. This was more necessary because of the 75 ft height of the walls. Heat losses through the walls would result in pronounced downdrafts of cold air during the heating season. Adaptation of conventional strip heater units, with consideration for wattage density, offered a way of meeting the need. Thirty-three wall mounted, convection type heaters are provided. These heaters, with fairly constant wattage density, supply the needed 396 kw of heating and cover 500 ft of the total of 570 ft of lateral exposure. Three wall mounted thermostats, set at 45 F, control the operation of these banks of heaters.

A 35 kw cabinet heater, with a centrifugal fan which has a downblast discharge, is located above the 21 ft by 25 ft doorway near the north end of the downstream wall. This unit operates to reduce drafts in the area by providing a blanket of warm air across the inside face of the large accordion steel doors.

Heat requirements in spaces of the power plant below grade lines are negligible except for one wall of the downstream corridor one level below grade. This wall is above the normal tail water level. Three cabinet type, floor mounted heaters of 50 kw capacity each, with integral thermostats, are provided to maintain 55 F.

Two portable electric heaters of 15 kw capacity each are provided for the use of work parties. Power circuits are available to serve these heaters in areas where they may be needed.

Control Bay Heating

The design approach for heating the control bay area was essentially the same as for the power plant. Twelve changes of outside air per hour are provided in most spaces and room temperatures are maintained at 70 F.

The supply fan operates continuously to deliver 10,700 cfm of tempered outside air to spaces at the three levels of the control bay. This air, which enters through a bank of fixed stormproof louvers, is drawn successively through two banks of blast preheaters. Each bank of preheaters has a capacity of 159 kw and provides heat in increments of 24, 45, 45 and 45 kw. A program switch, controlled by coordinated action of a duct thermostat and an outside thermostat, operates the heaters to provide air temperatures ranging from 68 to 75 F. This air passes through filters before entering the fan. After passing through the fan, a vertical concrete shaft and a system of metal ducts, the air is discharged at low velocity into various rooms — either through ceiling diffusers or through high sidewall grilles.

Except for vitiated air removed by a separate exhaust system, most of the air delivered to the control bay rooms passes through door louvers and into corridors. The air then passes along corridors into the cooler area of the power plant, where it performs the secondary function of contributing to power plant heating.

Heating loads of individual rooms in the control bay area are satisfied by unit heaters and recessed wall heaters. These heaters are controlled automatically by integral or wall mounted thermostats.

The unit heaters are of conventional design, but the wall recessed heaters have some features not found in conventional electric heaters. They consist of a small centrifugal type fan with upblast discharge, a vertical duct which houses one or more heating elements, and a grille with horizontal discharge. The entire unit fits into a wall recess 6 in. deep and mounts flush with the wall surface. Room air enters the fan inlet grille 1 ft above floor level and is discharged 1 ft below the ceiling.

These heaters provide from 1½ to 4 kw of heating and have proved to be very effective in maintaining and equalizing air temperatures of the rooms they serve.

Protective Equipment

All electric heaters, except the convection type, are provided with individual manual reset thermal cutouts. These devices operate to deenergize heater circuits automatically when sheath temperatures become excessive. Each section of the blast heaters is provided with a thermal cut-out. Groups of convection heaters are provided with thermal protective equipment at circuit distribution points.

Electric heaters which require operation of a fan to effect heat transfer have an electrical circuit interlock which will not permit heaters to operate unless the fan motor circuit is energized.

Oil room ventilation is protected with fire dampers equipped with 160 F fusible links and a mechanical interlock with CO_2 release. All principal ventilating fan motors are provided with undervoltage and overload protection.

Heating Design Notes

The heating needs of normally unoccupied spaces in the power plant area permit the use of controls which provide only moderately accurate temperatures. Heating of air supplied to various spaces is introduced in relatively large steps and is controlled by a single potentiometer type thermostat. The control equipment is not complicated.

Design considerations for the control bay area required more accurate temperature control to provide comfort for personnel. This is accomplished by a duct thermostat which operates two small auxiliary sections of the heater. The steps of initial air heating are controlled by an outside air thermostat and steps are comparable in size to the power plant area equipment. The duct thermostat operates the two auxiliary sections of the heater when small additional quantities of heat are necessary to keep the air temperature within established design limits.

Design of the heating and ventilating system for the Hungry Horse power plant was developed in the Bureau of Reclamation's structural and architectural branch, in the offices of Chief Engineer L. N. McClellan, at Denver.

PROPER AIR DISTRIBUTION and temperature and humidity control are critical problems (Both photos courtesy National Broadcasting Co.)

RAYDOMES ARE USED to pick up TV programs from outside the station — such as a ball game, for example. They present a number of heating and ventilating problems

Air Conditioning TV Stations

Air distribution and control problems and their solutions are reviewed. The author also discusses the heating and ventilating of TV raydomes

By F. F. Stevenson

THE AIR DISTRIBUTION in spaces housing television apparatus must be given careful attention. Projection rooms, equipment rooms, master control rooms, etc. have terrifically high internal sensible heat loads and require air volumes as high as 35 air changes per hour in some cases.

Consider, for instance, a tube rack room. In an area of about 600 sq ft and with a volume of about 7000 cu ft, a total sensible heat gain of approximately 185,000 Btu per hr may be concentrated. This amounts to about 300 Btu per sq ft. Of this total, 55,000 Btu may be charged to general heat gain and 130,000 Btu to the tube racks.

Even with a high air diffusion temperature difference, it is impossible to reduce the air changes to a reasonable figure.

These rooms consist of long rows of racks extending almost up to the ceiling, with a narrow aisle between every pair of racks.

Mr. Stevenson is a design engineer who has had a wide experience in air conditioning work with several of the large engineering and architectural offices.

Cooling Tube Rack Rooms

A commonly used method of cooling these rooms is to run an exposed supply air duct along the ceiling in every other aisle, with an exhaust duct at the ceiling in the aisle next to it. All air, by the way is exhausted from these rooms. A number of plaques are placed in each supply air duct, with exhaust grilles in the exhaust ducts. Not much can be said for such air distribution, except that it is inexpensive.

The best method — if cost were not a consideration — would probably be to bring in supply air just for the racks under the floor, discharging it into the bottom of each rack and exhausting out of the top into a common exhaust duct.

A smaller amount of additional air to handle the balance of the heat load could be brought into the room in a number of ways, to suit the convenience of the designer. Wall grilles, up high, blowing air through the run of the aisles, would be very good.

For a cheaper method of air distribution, I have used plaques with a neck diameter of 14 in. to handle 300 cfm and 19½ in. to handle 600 cfm. The plaque sections were placed 5 in. and 7 in. respectively, below the outlet of the neck. In order to provide additional resistance in each plaque, for more even control of the air flow into each outlet, a perforated plate with ¼ in. holes on ½ in. centers was placed between the bottom of the neck and the outlet section.

Exhaust was handled through exhaust ducts in every other aisle, with intake grilles located as required. The exhaust air was moved by a slow speed, belt driven fan, located far enough away from critical areas to avoid noise troubles.

Control for Apparatus Area

The automatic control of a year 'round air conditioning system for the apparatus area of one large television station may afford some interesting sidelights on this sort of work.

Due to the exhaust requirements of various spaces, a large amount of outside air — 61 per cent of the total supply — is used. The balance is return air. A considerable proportion of the area has outside exposure and most of it is on the top floor of the building.

Notwithstanding, many of the rooms — due to the extremely high

mechanical or electrical heat emission — have cooling loads in the winter. The area was divided into a number of zones, with low pressure steam reheaters in the branch ducts to each zone. The reheaters are controlled by modulating space thermostats.

Regardless of the winter cooling requirement, the exposed rooms have low pressure steam wall radiation on all outside walls, completely overlapping the window area. This was done in order to avoid cold downdrafts along the walls during extreme weather.

This arrangement gives excellent results. In fact, I hate to think of what would have happened without the radiation. In cold climates, there is only one thing — in my opinion— that will take the place of radiation along exposed walls and under windows and that is a forced circulation of warm air from the floor, blowing up vertically. Such arrangements are also a big help in keeping windows from frosting.

The control of the plenum is a bit complicated, but necessity forced it to be so. Outdoor design conditions are 95 deg in summer and −10 deg in winter. The outside air intake is divided into two sections — a minimum, non-modulating section and a maximum, modulating section — handling 61 percent and 39 percent of the total air, respectively.

Two low pressure preheater steam coils, each one row in depth, were placed in the minimum outside air section, the upstream coil controlled by a two position steam valve actuated by a thermostat in the outside air intake, and the downstream coil controlled by a modulating steam valve actuated by a plenum thermostat.

There is an air bypass around the preheater, with modulating face and bypass dampers of the proportioning type. A perforated plate in the bypass equalizes the resistance to air flow.

An oil panel, self-cleaning air filter is in the plenum downstream from the intake, followed by a chilled water cooling coil and a moisture eliminator. There is a steam grid humidifier on the discharge side of the fan. As the owner's engineer was dubious about possible odors from building steam, a separate steam generator was installed to supply low pressure humidifier steam. After the system operated for a while, the engineer tried out the building steam in the humidifier, reducing the pressure through a PRV. This proved perfectly satisfactory.

Basis for Control

The automatic control system was based on the following premises: During cold weather, the design temperature of the minimum outside air section was set at 52.5 deg. This air is mixed with return air at 72 deg to achieve a mixture temperature of 60 deg. When the outdoor temperature reaches 52.5 deg, no preheat is required and when the outdoor temperature rises over 52.5 deg, a plenum mixing thermostat opens the maximum outside air damper in a modulating manner and throttles the return air damper, in order to hold the required 60 deg in the plenum. When the outdoor temperature reaches 60 deg, both outside air dampers are wide open and the return damper closed, with the system operating on 100 percent outside air.

All outside air is used until outdoor temperature reaches 65 deg, when another thermostat in the air intake acts to run the modulating damper to its closed position and the system is again on minimum outside air for warm weather operation.

Design of the preheater section was predicated on an effort to meet critical temperature and humidity requirements in some of the zones, to meet the demands of the use of a large proportion of outside air even in very cold weather, the use of low pressure steam in the heating coils, and the desire to keep heating over-runs to a minimum by using the "on and off" controlled coil as little as possible.

It was deemed unwise even with steam proportioning (non-freeze) coils to use a modulating steam valve on the coil exposed to outside air, with steam in the line at less than 5 psig. Any arrangement of a coil with a two position steam valve (either no steam or full steam) and face and bypass dampers is subject to considerable variations in temperature, even if every effort is made to have the damper blades tight fitting.

Two preheater coils had to be used, because a one row coil — even with closely spaced fins — was unable to give the required temperature rise at the face velocity it was necessary to use. With two coils a "must," it was decided to always run some air through the bypass area, even during coldest weather, and attain the required minimum outside air temperature by mixing heated air from the coils with untreated outside air from the bypass. At −10 deg outdoors, a mixture of 67 percent heated air at 83 deg, when mixed with 33 percent of outside air, will give a mixture temperature of 52.5 deg.

This was determined by the following formula, where a is the percent of heated air required and the temperatures are in degrees absolute:

a = (mixture air temp. − outside air temp.)/(heated air temp. − outside air temp.)

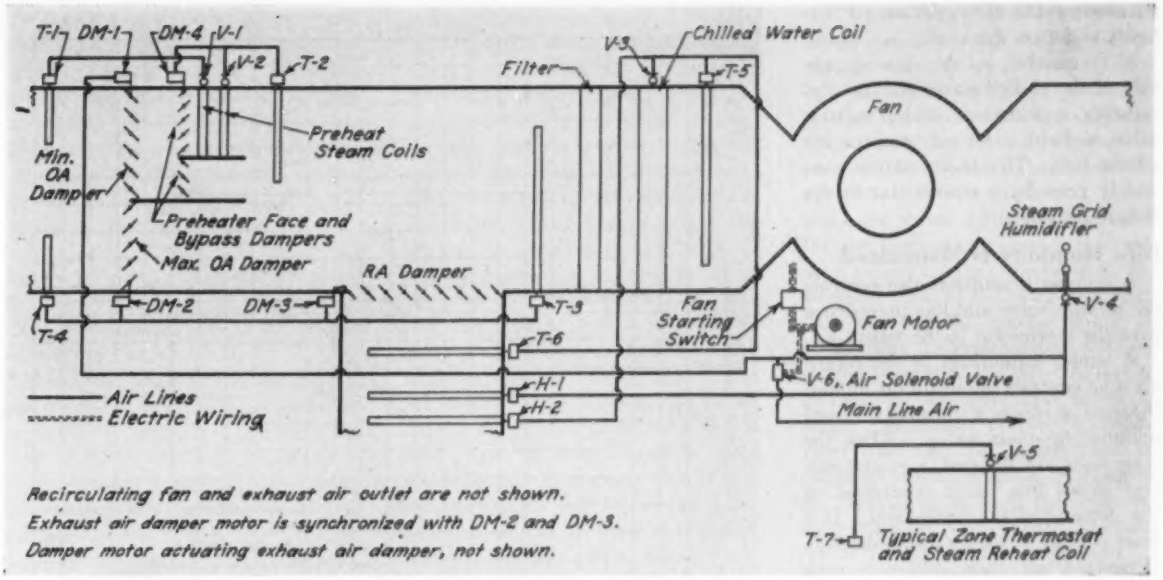
$a = (512.5 - 450)/(543 - 450) = 0.67$

A mixing thermostat downstream controls the modulating steam valve and the face and bypass dampers.

At −10 deg, both preheat coils are in operation, delivering air, as previously mentioned, at 83 deg, which when mixed with the proper quantity of untreated outside air gives the required mixture temperature of 52.5 deg.

As outdoor temperature rises, the preheat mixing thermostat will act to throttle the modulating valve on the second steam coil. When outdoor temperature rises to about 28 deg, the final temperature can be attained with one coil only, so the thermostat closes the modulating valve. At this point, then, the first coil alone has steam and the valve of this coil is either full open or closed. As outdoor temperature continues to rise, the mixing thermostat acts to open the bypass damper and throttle the face damper. Remember that the minimum bypass damper setting is never full closed; there is always air flowing through the bypass opening and also it was sized to handle the full amount of minimum outside air. When outdoor temperature rises to 34 deg, the thermostat controlling the valve on the first coil, acts to close this valve (typical coil freeze-up control).

Now, both coils are off and as soon as the heat over-run effect is dissipated, the mixing stat acts first



TYPICAL CONTROL SYSTEM for an air conditioning installation at a television station

Thermostats

T-1: Positive acting thermostat, in outside air intake, sensing temperature of outdoor air and controlling V-1.

T-2: Modulating thermostat, in preheater section, sensing temperature of air out of preheater section and controlling V-2 and DM-4.

T-3: Modulating thermostat, in plenum, sensing temperature of air mixture and controlling DM-2 and DM-3.

T-4: Positive acting thermostat, in outside air intake, sensing temperature of outdoor air and controlling DM-2, closing it when outdoor temperature rises to a predetermined figure and also opening DM-3.

T-5: Modulating thermostat in plenum, sensing temperature of air off the cooling coil and controlling V-3. Note: T-5 is reset by T-6.

T-6: Master thermostat in return air duct, sensing temperature of return air and acting to reset T-5.

T-7: Modulating zone space thermostat, sensing temperature in zone and controlling V-5.

Humidistats

H-1: Modulating winter humidistat, sensing humidity of return air and controlling V-4.

H-2: Modulating summer humidistat, controlling V-3.

Valves

V-1: Two position steam valve, normally open.

V-2: Modulating steam valve, normally closed.

V-3: Three-way chilled water mixing valve.

V-4: Modulating steam valve, normally closed.

V-5: Modulating steam valve, normally open.

V-6: Air solenoid valve, wired into fan starting switch, controlling source of air to the pneumatic control system.

Damper Motors

DM-1: Two position motor actuating minimum outside air damper.

DM-2: Modulating motor, actuating maximum outside air damper.

DM-3: Modulating motor actuating return air damper.

DM-4: Modulating motor, actuating preheater face and bypass damper.

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to throttle the bypass dampers and then to open the modulating steam valve.

As temperature continues to rise, the thermostat controls the steam valve in a modulating manner to hold 52.5 deg and when the outdoor temperature rises to this level, the steam valve is closed. As outdoor temperature rises above 52.5 deg, a thermostat in the outside air intake acts to run the bypass damper to its wide open position, close the face damper and take the modulating steam valve out of the control circuit. The mixing thermostat controlling the modulating steam valve and the preheater face and bypass dampers should have a sensitivity adjustment so it can handle its sequence of operation on rising and falling temperatures. It should be a reverse acting stat, exhausting air from its branch lines on a rise in temperature. The steam valve should be normally closed, with a 9 to 13 lb spring. As mixture temperature falls, the thermostat will keep 13 lb or more of air on the valve diaphragm, holding the valve open. When the mixture temperature rises, the stat will start to exhaust air from its branch lines and at below 9 lb, the valve will be tightly closed.

A 3 to 8 lb spring may be used on the damper motor. In the operation of the bypass damper, the motor is normally open, and the damper is open when air is exhausted from the motor piston chamber. Therefore, as temperature rises further and the stat continues to exhaust air from its branch lines, the bypass damper starts to open when air is reduced to below 8 lb and at below 3 lb it is wide open. There is danger in such sequence controls of the pressures overlapping, although in this case, with a difference of at least a pound between the sequences, no trouble was encountered. But if it does, the remedy is to use springs with a different tension or to use two thermostats, one set a little bit off from the setting of the other.

When outdoor temperature rises over 52.5 deg, another mixing stat, located in the plenum downstream of the filter, is made operative. This stat holds a plenum temperature of 60 deg by opening the minimum outside air damper in a modulating manner and throttling the return air damper. At 60 deg outdoors, 100 percent outside air is used and all return air is exhausted by the re-

circulating fan through an air exhaust outlet on the roof.

A thermostat on the downstream side of the chilled water cooling coil actuates a three-way water mixing valve to hold a set air temperature off the coil. This thermostat is constantly reset by a master stat in the return air duct.

How Humidity Is Maintained

A summer humidistat also controls the mixing valve and has precedence over the thermostat in the return air.

A winter humidistat in the return air duct controls the steam for humidification through a normally closed modulating steam valve. When the main fans are stopped, a safety control closes this valve regardless of the demand of the humidistat. If a finer control of winter humidification is desired, zone humidifiers — each with separate controls — could be used.

Space thermostats in each zone are set at 72 deg for winter. In summer they are reset in accordance with outdoor temperature through a masterstat with a properly shielded outdoor thermal element.

Interior spaces having a cooling load in winter were given a low supply air diffusion temperature difference and a large air volume, so that the cooling system would be able to hold the 72 deg space temperature in winter, as well as 80 deg at peak summer conditions.

Summer-winter switches, P-E switches, air solenoid valves, cumulators, air relays etc. were used as required.

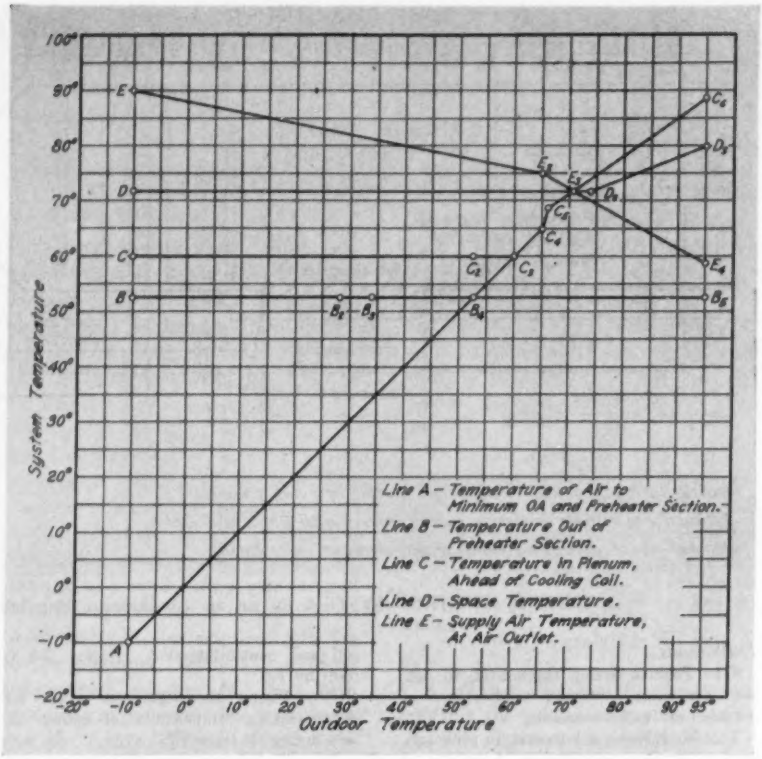
The system described operates with full satisfaction.

Heating, Ventilating Raydomes

A small structure — known as a raydome — is a feature at a number of television stations. When a program originates from outside the station — like a ball game or a public event — and is picked up by a portable transmitter, the latter is beamed to the raydome, which houses receiving equipment. The raydome — like a transmitter — is located as high as possible.

I have designed the heating and ventilating equipment for several raydomes. A brief description of their features may be of interest. They are small structures, shaped like a cylinder with a domed top, are about 6 to 8 ft in diameter, 7 to 10 ft high and are located in some cases about 45 stories above the street level. They are fabricated of ½ in. plexiglass, supported by metal structural members on a concrete or masonry base. The glass area is about 215 sq ft and the cubical content about 325 cu ft. The conductivity coefficient of plexiglass was taken as 1.5 Btu and its resistance to the passage of solar radiant heat was taken the same as ordinary plate glass.

For winter heating, with a design outdoor temperature of −10 F and


System Temperature
Outdoor Temperature
Line A – Temperature of Air to Minimum OA and Preheater Section.
Line B – Temperature Out of Preheater Section.
Line C – Temperature in Plenum, Ahead of Cooling Coil.
Line D – Space Temperature.
Line E – Supply Air Temperature, At Air Outlet.

PLENUM, SPACE AND SUPPLY AIR conditions in a typical zone, which requires heated air in winter

A — B_4, range of outside air temperature, entering preheater section.

B — B_5, face damper at preheater wide open, bypass damper at minimum position; both preheater coils, anti-freeze and modulating, in operation.

B_2 — B_3, anti-freeze coil on only, preheater dampers modulating.

B_3 — B_4, modulating coil on only, face damper wide open, bypass damper at minimum position.

B_4 — B_5, both coils off, face damper closed, bypass damper wide open.

C — C_2, minimum OA damper open, maximum or modulating OA damper closed.

C_2 — C_3, minimum OA damper open, maximum OA damper moves in a modulating manner from closed to wide open.

C_3 — C_4, minimum OA damper open, maximum OA damper open.

C_4 — C_5, minimum OA damper open, maximum OA damper closes.

C_5 — C_6, minimum OA damper open, maximum OA damper closed.

D — D_2, space temperature, winter, spring and fall.

D_2 — D_3, space temperature, summer.

E — E_3, supply air temperature range, winter, spring and fall.

E_2 — E_3, supply air temperature range, spring and fall.

E_3 — E_4, supply air temperature range, summer.

Heating & Cooling Work

Area A, B, B_4 shows work of preheater section.

Area C, C_4, C_3, C_4, C_5, E_3, E_2, E shows work of zone reheater.

Area E_4, E_3, C_6, shows work of cooling coil.

Between outdoor temperatures of 60 and 75 deg, the action of the humidistat may deliver air off the cooling coil at too low a temperature to meet the requirements of Line D. Then reheat will be used.

Also, in the above mentioned outdoor temperature range, the amount of the internal sensible heating load (people, lights, etc.) may dictate a lower supply air temperature than indicated by Line E.

Line E, E_2 in actual operation will not be a completely straight line and may rise above 90 deg in certain zones.

an inside temperature of 80 F, the load was calculated to be approximately 24,000 Btu per hr. On account of the high wind velocity, an augmented external film coefficient was assumed for the plexiglass. No credit was taken for the heat emitted by the equipment, because it is out of use during long periods.

The heating medium is an electric heater of 7 kw capacity or about 24,000 Btu per hr. It is capable of raising the temperature of the volume of air handled about 56 F.

Air is supplied to the dome by a small blower fan having a capacity of about 400 cfm. It is located in the base of the dome and is connected on its intake side to a small air plenum. The plenum has an intake for outside air and another for return air with manually adjustable louver dampers, so that the fan can use all outside air, 100 percent recirculated air, or any mixture in between. The air is discharged directly into the dome through a streamlined grille. An air filter of the replaceable type is placed in the outside air intake. The peak heating load required a diffusion temperature difference of about 56 F and this meant that the air supply temperature must be 136 F to hold 80 F inside the dome. This would require 100 percent recirculated air, which was not deemed desirable, so a mixture was used in extreme winter weather and the inside design temperature reduced 15 or 20 F.

The summer treatment of the raydomes is entirely by ventilation, the supply air not being cooled. This means that the supply air temperature is about the same temperature as outdoors; actually, it is a little higher due to fan heat. The heat emitted by the apparatus and the solar heat during a hot sunny day in June or July is in the order of 12,000 to 15,000 Btu per hr and the resulting dome temperature is 125 to 130 F. The solar heat is not too great a factor, because of complete shading during part of the day and also because a large portion of the radiant rays transmitted by the glass go right through the dome and out through the glass on the other side. Some radiant heat absorbed by the glass and some impinging on the opaque surfaces inside the dome is converted into a cooling load, but as stated, it was not of great consequence.

The above assumes that plexiglass acts about the same as glass to ultraviolet rays, visible rays and infrared rays. An electric thermostat was placed in the dome to start and stop the fan, summer and winter. The summer operation of the stat is to start the fan on a temperature rise and stop it on a temperature fall. The winter operation starts the fan on a fall and stops it on a rise in temperature. A summer-winter switch was provided along with other suitable control equipment to change the setting and reverse the action of the thermostat. At certain outdoor conditions during spring and fall the fan is idle. After a period of two or three years in the operation of the raydomes, it is pertinent to make a few observations as to how the design features actually work out in performance.

Raydome Operating Problems

The first item for correction was the forming of condensation on the exposed metal parts of the equipment. Most of the apparatus is sealed, but there are some exposed parts and with considerable sulphur bearing smoke and soot in the atmosphere, condensation is corrosive. Incidentally, a small replaceable filter is not too effective in filtering out smoke and soot particles which are very light in weight. Condensation in the summer generally occurred with the fan on 100 percent outside air, late afternoon and evening conditions moderately warm and humid, and with the dry bulb temperature falling rapidly during the early hours of the night. The lowering of the temperature in the dome cooled the metal parts and also stopped the fan. The temperature in the dome dropped in proportion to outdoor temperature, but with the fan stopped and no outside air being brought into the dome, the dew point temperature remained high. Soon, the temperature of the metal parts of the equipment fell below the dew point of the air and there was condensation. At first, a small container of silica gel was placed in each dome. This did not absorb moisture fast enough in humid weather and the absorbent had to be constantly replaced, which was a nuisance. Then the fan was kept running during the early hours of the night. This helped, but did not entirely eliminate the trouble.

If I were designing a dome today, I would use a cooling coil in the fan system, using water if I could get it cold enough or a direct expansion refrigerant. This would not only stop the condensation by reducing the dew point of the air, but by also reducing the dry bulb temperature it would make the dome a little more livable for the technicians when it is necessary to service the apparatus in hot weather. One of the small dehumidifiers now on the market might be satisfactory. Condensation also occurred in winter, but this was due to leakage in the structural members which admitted moisture during rainy weather. The domes must be build 100 percent tight. In order to do everything to keep the temperature down in hot weather, I would try to install the fan and motor so that as little motor and drive heat as possible would get into the air supply. Perhaps a little money spent in remote controls for the outside air and return air dampers would save considerable bother now required for adjusting them manually.

Another winter problem was the formation of ice and hard-packed snow around the raydomes during bad weather. The domes are located on the edge of the roof of the building, some 400 ft above the street, and the prospect of a large chunk of ice breaking loose and falling on a pedestrian has frightening implications, to say the least.

If domes must be located high up and at the outer extremity of the building wall, the only thing to do is to prevent ice from forming by raising the inside temperature of the dome. This can be done by using all or a large percentage of return air as required in winter. With an inside temperature of 110 F, when it is, say, 20 F outside, the external surface of the glass will be about 30 F, which will discourage ice formation.

In the original design, the electric heater had only one step of control, on or off. Better performance and economy of operation could be had if the heater were split up into two or three sections, with a separate switch for each, so that control would be in sequence, with the individual sections being energized only as required.

[Mr. Stevenson's article on television stations in the May HPAC was devoted to heat loads and design temperatures. In July, he discussed sound control problems.]

SOME OF THE NDHA'S OFFICERS, executive board, committee chairmen
Front row: Vernon J. Suche, Thomas P. Brown, Jr., Charles W. Deeg, and Percy A. Hyde.
Second row: Julius J. Schenk, John C. Haroldson, David W. Loucks, Walter M. Gillespie, Homer A. Lawrence, and Leo F. Collins.
Third row: James W. Heaton, Foster L. Stephens, Jay P. AuWerter, and John F. Collins, Jr.
(Picture by Carl W. Signor)

District Heating Progresses

Reports at NDHA's annual meeting cite the year's developments

By John F. Collins, Jr.
Secretary-Treasurer of NDHA

MANY PHASES OF district heating were presented and discussed at a four-day meeting of the National District Heating Association, held this year at the Lookout Mountain Hotel, near Chattanooga.

One of the most interesting of the NDHA's annual compilations is that of the operating statistics committee. This year, Foster L. Stephens, Allegheny County Steam Heating Co., Pittsburgh, chairman, summarized the reports turned in by 57 of the larger steam heating utilities from coast to coast.

He said there was in 1952 a decrease in total steam sales from 1951 of 1.8 percent — which was to be expected, since the weather was warmer (the decrease in degree-days being 5.5 percent.)

Customers Increase

However, the number of customers of the 57 companies increased 1 percent, the connected load 2.0 percent and the total revenue 2.0 percent. Reflecting the increase in steam rates, the average revenue per 1000 lb of steam sold increased 3.9 percent.

The expense items also continued upward. The principal fuel used — coal — cost 1.28 percent more per million Btu. An increase in wages (somewhat offset by a decrease in the number employed) resulted in a net increase in the total average wage cost of 6 percent.

A favorable sign was the fact that although capital investment increased 1.6 percent, the investment per dollar of income continued to decrease.

Construction of distribution lines continued. On the basis of square feet of external pipe surface in use, there was an increase in 1952 of 1.4 percent in the amount of distribution mains.

Unaccounted-for Losses Down

The research, the metering and the steam losses committees were all searching in 1952 for means of decreasing "unaccounted-for" steam losses. For the year, the steam losses decreased 2.8 percent per sq ft of distribution system pipe surface, or 1.9 percent in total poundage.

Pertinent statistics on steam and hot water rates in use in 100 communities in the United States and Canada were collected by the NDHA rates and regulations committee and were reported on by Clifford O. Thurlow, of Commonwealth Services, Inc., Jackson, Mich., the committee chairman.

Mr. Thurlow said there were 13 rate increases and no decreases during the 12-month period ending last February 1. One utility, which previously had not taken steps to offset its rising expenses by a higher tariff, increased its rates 33 percent. Four companies reported increases of about 25 percent. Seven reported increases of between 10 and 15 percent and one an increase of less than 10 percent.

Reports Selling Progress

Progress being made in selling district heating to new customers was reported on by Sterling S. Sanford, of The Detroit Edison Co. He said that in 51 cities, 676 new customers had been connected. No customers were taken on the lines in the other 12 cities for which he reported. He estimated that the new customers annually would require 1,338,520 M lb of steam costing $1,726,975 at the average price of $1.29 per M lb. However, the number of buildings connected has decreased each year

EICHORN 58-1

since 1950 and the connections made were less in number than for any year since 1946.

It is of interest that 54 per cent of the connections were to old buildings taking service for the first time, 18 percent were to new buildings and 28 percent to buildings which had had service at some previous time.

Most of the new revenue obtained came from use groups including (1) office buildings, banks, etc., and (2) hotels, apartments, clubs, hospitals and residences.

Not all utilities reporting had capacity sufficient to add customers. At 10 locations there was not sufficient boiler capacity and at eight others it was somewhat limited. Three companies will add boilers in 1953, four increased their boiler capacity by 160,000 lb in 1952 (which compares with the 1951 increase of 405,600 lb.)

Forty-one cities have adequate distribution facilities. In 10 the equipment is limited. Of the eight other cities lacking such facilities to take on customers, two expect to make improvements this year. Less extensions, however, are planned for 1953 than were made in 1952.

Seventy customers and $232,000 in annual revenue were lost in 16 cities in 1952. Almost half the losses occurred in two cities and were due to the increased cost of service. Aside from cost, other factors resulting in the loss of customers were necessity for year 'round service, which was unavailable, and deterioration of the utility's equipment.

The report of Alfred T. Veness, of the Rochester Gas and Electric Corp., chairman of the past-presidents committee, threw further light on the sales situation. Mr. Veness summarized the answers received to a questionnaire sent to the 16 largest steam utilities. He said that nine of the companies are not actively soliciting sales — yet more than half said that prospects for new business are encouraging. Most of these utilities would take on new load if the prospect's building were on or near the lines — which indicates that the increased cost of constructing steam lines is a very pressing problem. Utility requirements to connect to the buildings of prospective customers are becoming more stringent.

Mr. Veness found that most utilities had recently increased their rates or were considering doing so. Fifteen of the 16 companies said that under their new rates they still are competitive with other fuels. Fourteen utilities said their earnings were satisfactory or improving — a welcome and encouraging change from the not-too-distant past. A normally cold winter would be helpful.

Seek Air Conditioning Load

Most large heating utilities are seeking summer loads to improve their load factors. Several are actively going after air conditioning. Where it is available, owners of new buildings almost without exception contract for service as do owners of buildings with worn-out boilers. The desire for clean air in large cities may in time be a sufficient factor to cause the construction of systems where they do not now exist, it was reported.

Mr. Veness said that at times of minimum temperature, practically all utilities try — for reliability of service — to maintain spare boiler capacity equal to that of their largest boiler. One company, in order to continue this policy, is planning to install an oil-fired boiler to supply steam during periods of peak load. Another is planning a 4800 ft feeder line to boost the pressure in its distribution system.

Officers of the association in their respective annual reports revealed that the organization is in excellent condition financially, with its membership at an all-time peak and its technical committees active. Colleges and universities having campus heating plants have joined the association in recent years to such extent that a special session was held for them, presided over by George K. Saurwein of the New England Gas and Electric Association (and formerly of Harvard.)

The house organ of the association — which for almost 40 years has been called the Bulletin of the National District Heating Association, — will, beginning with the next issue, be known as District Heating and will be enlarged.

A completely revised 1953 edition of the booklet Principles of Economical Heating will be off the press this fall, according to David W. Loucks, of Pittsburgh, chairman of the educational committee.

On rare occasions in its past history, the NDHA has awarded honorary memberships. This year, for outstanding achievement in the industry and for the association, it tapped J. Earl Seiter, manager of the steam department of the Consolidated Gas Electric Light and Power Co. of Baltimore, and presented him with a scroll at the annual banquet.

Charles W. Deeg Elected

At the closing session, the following were inducted into the offices to which they had previously unanimously been elected.

Charles W. Deeg, Philadelphia Electric Co., president.

Thomas P. Brown, Jr., New York Steam Corp., first vice president.

Leo F. Collins, The Detroit Edison Co., second vice president. [Editor's note: Mr. Collins is a member of HPAC's board of consulting and contributing editors.]

Vernon J. Suche, Union Electric Company of Missouri, St. Louis, third vice president.

Jay P. AuWerter, C. E. Squires Co., Cleveland, director.

Walter M. Gillespie, Dayton Power and Light Co., director.

John C. Haroldson, Duluth Steam Corp., director.

The retiring president, Percy A. Hyde, of Akron, remains on the executive board, as do Robert B. Donworth, Pittsburgh, Joseph Kildare, Philadelphia, Homer A. Lawrence, Cleveland, and NDHA Secretary-Treasurer John F. Collins, Jr., Pittsburgh.

[Technical papers presented at the NDHA meeting will be reviewed in a second article.]

Exceed Production Records at Three Plants

ANDREW GAGARIN, president of the Torrington Mfg. Co., reported to stockholders recently that the firm's three plants exceeded all production records during the first quarter of 1953 and shipped goods valued at $3,188,460 — nearly double 1952's first quarter sales.

The first quarter net profit this year was $160,606, compared with $79,025 a year ago and $149,263 for the first quarter of 1951. First quarter sales for 1951 were $2,068,255.

Steam Piping and Valves for 1100 F Service

By Frank A. Ritchings and Sabin Crocker

Results are available from extended research on the behavior of austenitic and ferritic steels in a steam atmosphere at 1100 F. Allowable stresses at temperatures up to 1100 F and higher have been assigned by code committees with respect to long-time strength as determined from creep and stress-to-rupture tests. Two large boiler-turbine units employing austenitic piping for 1100 F throttle steam temperature are being installed this year. Austenitic steels are definitely expensive, however, and alloying elements, particularly nickel and columbium, are in short supply.

The present paper reviews existing data and speculates on whether low-alloy-content ferritic steels could be made to serve the purpose. Spot comparisons are made of the relative cost of austenitic and ferritic steel pipe of equivalent carrying capacity. (See Table 1 for identification of the austenitic and ferritic steels considered).

THIS PAPER is concerned primarily with the design of piping for large steam-turbine boiler units operating at temperatures in the vicinity of 1100 F. The most serious problem involves the properties of materials at this temperature level. The strength of materials tends to decrease with temperature so that most steels suitable for service at lower temperatures do not possess sufficient strength at 1100 F to sustain the requisite loads for long periods of time without rupture or at least excessive deformation. This tendency for strength to decrease with temperature demands a corresponding increase in pipe wall thickness in order to keep stresses within safe limits. The problem is accentuated by the fact that as throttle temperatures are raised in successive steps, steam pressures are too, so that there is a dual need for increasing the wall thickness.

The properties of principal value as criteria of the suitability of materials for high temperature steam service are creep strength and rupture strength as determined on laboratory specimens over long periods of time at the expected operating temperature. Physical properties obtained by short-time tests of laboratory specimens at room temperature and at the operating temperatures also are of interest. Further, short-time physical tests on specimens that have been exposed to the operating temperatures for long periods are desirable for checking on the stability of a material.

Additional characteristics demanding consideration are corrosion resistance, immunity to graphitization, stability of carbides, soundness of manufacture and adaptability to fabrication operations including upsetting, bending and welding. Some of these characteristics are outside the scope of laboratory investigation and require full-scale manipulation of the product for adequate determination. To reach significant conclusions, other characteristics have to be observed in a superheated steam atmosphere or under stress, and usually for long periods of time.

There are several central stations having steam temperatures of the order of 1050 F, one or more of which have been in operation for periods up to five years. Likewise there are installations on shipboard for temperatures as high as 1020 F which have been in service for several years. The next logical step is to go to 1100 F with a corresponding increase in steam pressure.

Much laboratory work has been done toward investigating the properties of piping materials for 1100 F steam service and the results of these investigations are available for analysis. As long ago as 1929 and continuing for a 10 year period or longer, an experimental superheater and piping system for 1100 F steam was kept in operation by The Detroit Edison Co. as a proving ground for high temperature materials and construction (1).[1] More recently, code requirements have been set up for some materials to govern their use at steam temperatures of 1100 F or higher. A considerable amount of superheater tubing is already in use at such temperatures, and one large boiler-turbine unit using 1100 F steam is scheduled for commercial operation this year at the Kearney Station of the Public Service Electric and Gas Co. of New Jersey with a second now being installed.

The purpose of the present paper is not to report the results of further scientific research along the foregoing lines, although much of interest remains to be done. The aim in this case is to use existing information as a basis for extending design to 1100 F; the field is that of *applied* metallurgy and economics as distinguished from metallurgical *research*. The various angles involved are covered in the respective sections which follow. After reviewing the criteria available for guidance in selecting materials for 1100 F service which were used by code committees as bases for setting allowable stresses (*S* values), consideration is given to

Mr. Ritchings is Chief Mechanical Engineer, and Mr. Crocker is Mechanical Engineer, Ebasco Services Inc. Mr. Crocker is a member of HPAC's board of consulting and contributing editors. *This paper was presented at the 1953 semi-annual meeting of the American Society of Mechanical Engineers, held in Los Angeles.*

[1]Numbers in parentheses refer to bibliography to be given at end of paper.

deriving S values for other likely materials not yet included in code tables. Available pipe and valve materials are then discussed and evaluated with respect to possible deterioration in service for long periods of time at the operating temperature through corrosion, loss of impact strength, embrittlement, carbide migration, graphitization and other ills to which metals are susceptible with time and temperature.

Performance Criteria for 1100 F

In considering the feasibility of going to a steam temperature of 1100 F several criteria used at lower temperatures are available for guidance. The following principal ones are analyzed:

Code Bases for S Values: The bases used in preparing the allowable stresses (S values) adopted by the ASME Boiler Code Committee for piping installed in connection with power boilers were published in Mechanical Engineering, August 1951, pages 675 and 676, together with a table giving the new stresses. The acceptability of these new bases and stresses for use under the American Standard Code for Pressure Piping, ASA B31, was announced in the October 1951 issue of Mechanical Engineering, Case No. 7, page 867. The S value adopted for each material and temperature was taken as the *lowest* one of the following stresses depending on whether the temperature is within the elastic or plastic range for the particular material:

1) One-quarter of the minimum specified tensile strength at room temperature.

2) One-quarter of the tensile strength at the respective operating metal temperature as reported by test data.

3) 62½ percent of the yield strength at the respective operating metal temperature as reported by test data.

4) A conservative average of the stress to give a creep rate of 1 percent in 100,000 hr at the respective operating metal temperature as reported by test data.

5) 60 percent of the average or 80 percent of the minimum stress to produce rupture in 100,000 hr at the respective metal temperature as reported by test data.

At metal temperatures below the creep range (usually starting at 700 F to 800 F) allowable stresses are established at the lowest value of stress obtained from using 25 percent of the specified minimum tensile strength at room temperature, or 25 percent of the minimum expected tensile strength at the operating temperature, or 62½ percent of the minimum expected yield strength for 0.2 percent offset at the operating temperature. Below the creep range, no credit is allowed for any improvement in room temperature tensile strength by special heat treatment.

At temperatures within the creep range, allowable stresses are based on 100 percent of the stress to produce a creep rate of 1 percent in 100,000 hr, the values so chosen also being limited to 60 percent of the average stress to produce rupture at the end of 100,000 hr or 80 percent of the minimum stress for rupture in 100,000 hr, whichever is lower. In any case, the values chosen are based on a conservative average of many reported tests as evaluated by the subcommittee, greater weight being given to the results of long-time tests. In most cases the creep stress is well below the rupture strength; rarely do the stresses listed approach the rupture strength. In a few cases the committee approved stresses without any rupture test data on the specific composition, such approval being based on neighboring compositions.

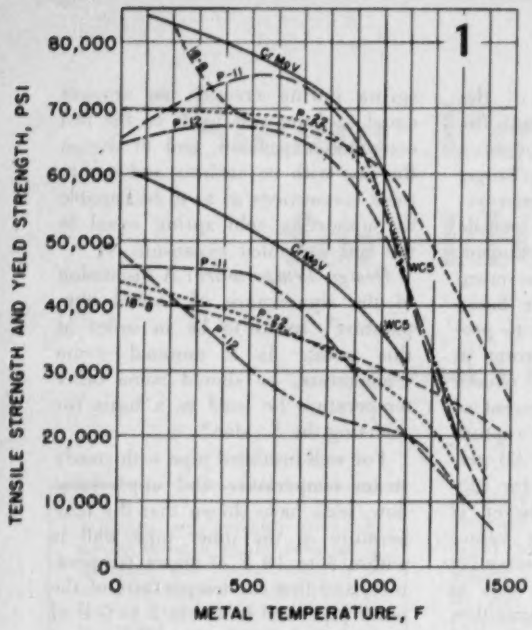
In the transition range of temperatures, stresses are limited to values obtained from a smooth curve joining the low and high temperature ranges but lying on or below the curve of 62½ percent of the minimum expected yield strength at the operating temperature. Although allowable stresses within the plastic range are set with regard to the creep rate and rupture strength of the respective materials at the operating temperature, nevertheless the physical properties in the elastic range between room temperature and the plastic range, shown in Figs. 1, 2 and 3, are of interest in the heating and cooling cycle for the line. This interest arises from the necessity of providing for considerable cold spring in designing an 1100 F line to take care of thermal expansion. If the line is not cold sprung nearly the full amount of expansion when it is installed, stress analysis shows that localized bending stresses in the 1100 F condition will cause a permanent set representing an equivalent amount of cold spring when the line cools down. This is sometimes called "self springing." With lines intended for operating at 1100 F it seems advisable to cold spring during erection an amount equal to from two-thirds to the full computed expansion, and to design the line with its anchors and equipment connections so as to be capable of supporting cold spring equal to the full computed expansion.

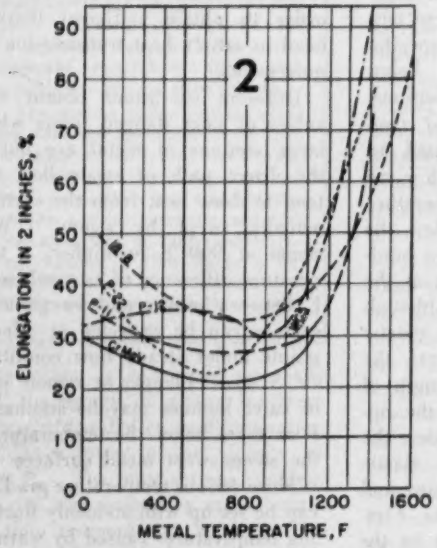
Design Temperature: A discussion of the significance of "metal temperature" seems to be in order at this point. Is it nominal steam temperature, or should some other temperature be used as a basis for selecting the S value?

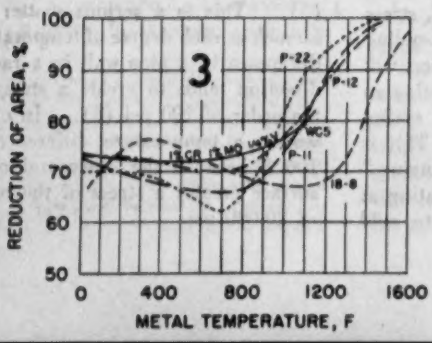
For well-insulated pipe with steady steam temperature and appreciable flow, tests have shown that the temperature of the inner pipe wall is within 5 to 10 F of steam temperature, and that the temperature of the outer pipe wall is within 2 to 5 F of that of the inner wall. This is not true of bare or poorly insulated pipe which tends to be considerably cooler than the steam, nor of superheater tubes where the metal may be 100 F or more hotter than the steam in order to obtain sufficient thermal head to satisfy heat transmission requirements.

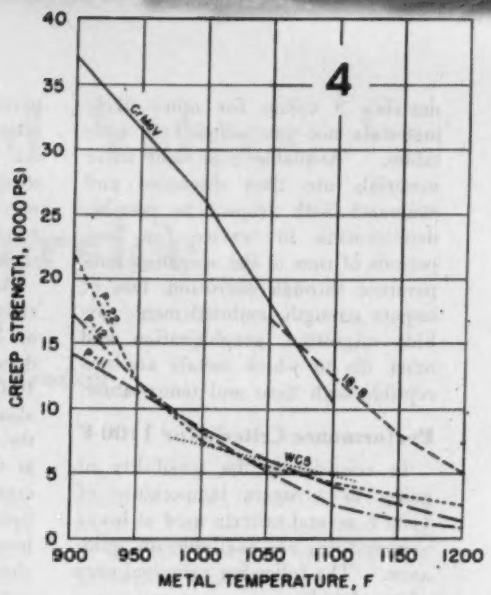
Different conditions obtain with valves or near flanged joints where large sections of metal are out of the direct path of steam flow and tend to draw heat from the surfaces actually swept by steam. With steam at 900 F or higher, a temperature difference of as much as 50 F between steam and swept metal surface can be expected at affected points under steady flow conditions (2, 3, 4). Flanges or remote parts of valve bonnets may be another 50 F or more below the temperature of the steam-swept metal surfaces (4).

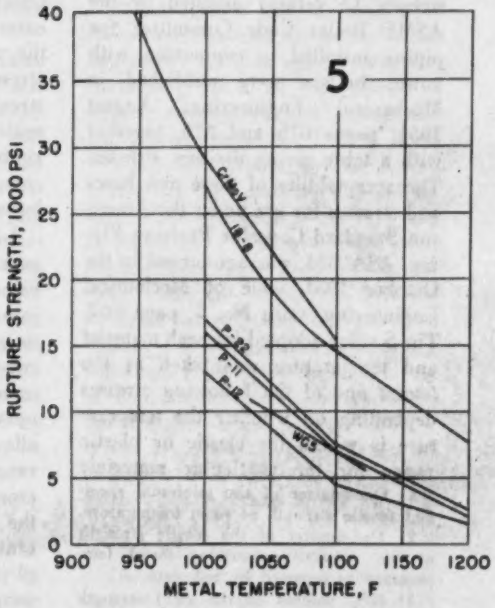
More serious temperature gradients can be set up with suddenly fluctuating temperatures caused by warming up a line too fast, by quenching due to carry-over, the use of water in desuperheating stations, or similar causes. Radial temperature differences between inner and outer pipe surfaces of 100 F to 200 F have been observed under these circumstances (5). This is a serious matter inasmuch as each degree of temperature difference in a pipe wall in a radial direction tends to create a stress of the order of 200 psi (6). In other words, a temperature difference of 100 F between the inner and outer surface creates a stress of the order of 20,000 psi.

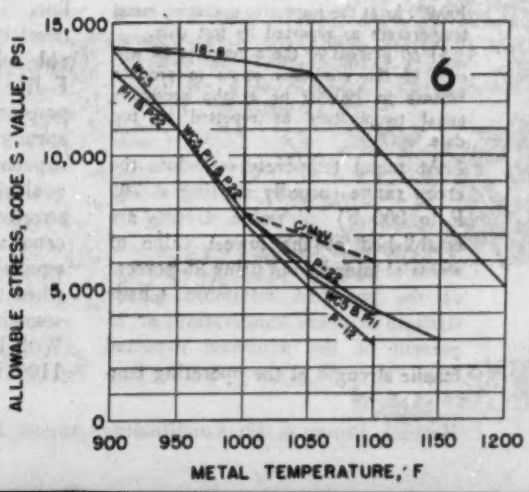

1
TENSILE STRENGTH AND YIELD STRENGTH, PSI
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
0
500
1000
1500
METAL TEMPERATURE, F
18-8
P-11
P-12
P-22
Cr-Mo-V
WC5


2
ELONGATION IN 2 INCHES, %
90
80
70
60
50
40
30
20
10
0
0
400
800
1200
1600
METAL TEMPERATURE, F
18-8
P-22
P-11
P-12
Cr-Mo-V


3
REDUCTION OF AREA, %
100
90
80
70
60
50
0
400
800
1200
1600
METAL TEMPERATURE, F
P-22
P-12
WC5
P-11
18-8
1¼ CR ½ MO
¼ V


4
CREEP STRENGTH, 1000 PSI
40
35
30
25
20
15
10
5
0
900
950
1000
1050
1100
1150
1200
METAL TEMPERATURE, F
Cr-Mo-V
18-8
WC5
P-22
P-12
P-11


5
RUPTURE STRENGTH, 1000 PSI
40
35
30
25
20
15
10
5
0
900
950
1000
1050
1100
1150
1200
METAL TEMPERATURE, F
Cr-Mo-V
18-8
P-22
P-11
P-12
WC5


6
ALLOWABLE STRESS, CODE S - VALUE, PSI
15,000
10,000
5,000
0
900
950
1000
1050
1100
1150
1200
METAL TEMPERATURE, F
18-8
WC5
P11 & P22
WC5 CLA P22
Cr-Mo-V
P-22
WC5 & P-11
P-12

Thermal shock produced by too rapid fluid temperature changes, with ensuing differences in temperature throughout the pipe wall, tends to produce unequal expansion or contraction between adjacent layers of metal. If the temperature differences are too great and too often repeated, surface cracks will develop which may ultimately progress to the point of failure of the member (7, 8). The severity of such shocks tends to increase with the operating temperature, while the potential damage from failure increases with the pressure as well. Hence, with 1000 F to 1100 F piping every precaution should be taken to guard against the possibility of damage from such causes.

The Power Section of the ASME Boiler Construction Code and the ASA B31 Piping Code both recognize the likelihood of variations in pressures and temperature and provide for it in words to the following effect:

Either pressure or temperature, or both, may exceed the nominal design values if the bursting stress in the pipe wall computed by the formula for pipe wall thickness does not exceed the stated *S* value for the design temperature by more than the following allowances for the period of duration indicated:

1) Up to 15 percent increase during 10 percent of the operating period.

2) Up to 20 percent increase during 1 percent of the operating period.

The swings provided for the foregoing presumably are incidental to sudden changes in turbine load, irregularities in the functioning of superheat control devices, and the like. Aside from these swings there is another possibility of increased operating temperature due to design tolerance in building the superheater. A commercial tolerance of plus or minus 10 F is frequently allowed in buying a power boiler. Likewise where there are two steam outlets on the superheater header, one may be delivering steam above the specified temperature tolerance and the other below, although the temperature of the subsequently mixed steam may be within limits. Another point to consider in designing steam piping is the frequent practice of specifying the temperature of steam leaving the superheater at 5 F higher than turbine throttle temperature in order to have a margin for temperature drop in the line.

Consequently, some engineers design piping to be suitable for continuous operation at a temperature 10 to 15 F higher than the nominal throttle temperature in order to match the steam temperature to be expected if the superheater design tolerances come out on the high side. The runs of pipe where there are two steam outlets from the same superheater sometimes are designed for a still higher temperature up to the mixing point. The use of such margins may lead to overdesign of the piping, but at least it is on the safe side. At 1000 F to 1100 F, where *S* values fall off rapidly with small increments of temperature, however, overdesigning by only a few degrees results in an appreciable handicap and should not be overdone.

On the other hand, tests have shown that the metal temperature in valve bodies may be 50 F or so lower than steam temperature owing to drawing heat from the steam swept portions to compensate for losses from the bonnet where there is no steam circulation (4). Some valve manufacturers contend that this warrants their using a lower design temperature with a corresponding higher *S* value. This seems questionable practice, however, inasmuch as any difference in temperature throughout the valve body tends to produce unequal expansion strains.

Physical Properties of Typical Steels: In addition to the five criteria used by the code committees for setting allowable stresses, as noted above, the other physical characteristics of interest in making the best selection possible, especially for a steam temperature as high as 1100 F, are ductility, impact strength and hardness at room temperature, and the operating temperature. All of these items, observed both before and after prolonged exposure to the operating temperature, can be helpful to design engineers in selecting materials for high temperature service. The microstructure before and after exposure is another indication of the degree of stability. References listed in the bibliography contain further information on these points.

Several piping steels available for use at steam temperatures of 1000 F to 1100 F have been selected for purposes of discussion in this paper, and to illustrate how code criteria were applied in determining *S* values and how these criteria might be extended to new materials. The properties of these typical steels serve to illustrate some of the points that need consideration in going to 1100 F steam temperature. The choice of materials selected is by no means all inclusive but it does serve for developing some of the points at issue. It is hoped proponements of other steels will contribute similar data.

The chemical compositions and room temperature tensile properties listed in Tables 1 and 2, with the exception of those for chromium-molybdenum-vanadium steel, came from the ASTM specifications for the respective steels; information about chromium - molybdenum - vanadium steel came from reference (9) and unpublished data furnished through the courtesy of the General Electric Co. The impact properties shown in Table 3 came from references (9), (10), and (11); unfortunately the authors were unable to locate impact data for all of the typical steels covered in their comparison. The properties plotted in Figs. 1 to 5 inclusive came principally from the Miller-Heger Report, reference (12); data on WC5 came from reference (13). Allowable stresses shown in solid lines in Fig. 6 were taken from revisions to the Power Sections of the ASME Boiler Construction Code, and the ASA B31 Code for Pressure Piping cited earlier in this paper; stresses shown in dash lines are speculations of the authors.

The graph values designated 18-8

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1 TENSILE STRENGTH and yield strength for alternative pipe steels, from room temperature to 1100 F and higher

2 ELONGATION in 2 in. gage length for alternative pipe steels, from room temperature to 1100 F or higher

3 REDUCTION OF AREA for alternative pipe steels, from room temperature to 1100 F or higher

4 CREEP STRENGTH (1 percent creep in 100,000 hr) for alternative pipe steels, from 900 F to 1100 F or higher

5 STRESS TO RUPTURE in 100,000 hr for alternative pipe steels, from 950 F to 1100 F or higher

6 ALLOWABLE STRESS (*S* value) vs. metal temperature for alternative pipe steels, from 900 F to 1100 F or higher

TABLE 1—CHEMICAL COMPOSITIONS OF alternative piping steels for 1000 F to 1100 F steam service

Usual Name	Structure	ASTM Designation Spec No.	Grade	Chemical Composition, Percentage by Weight (Check Analysis) Carbon Max.	Manganese Range	Phosphorus Max.	Sulphur Max.	Silicon Range	Chromium Range	Molybdenum Range	Nickel Range	Other Elements
1¼% Cr ½% Mo Pipe	Ferritic	A335	P11	0.15	0.30 to 0.60	0.030	0.030	0.50 to 1.00	1.00 to 1.50	0.45 to 0.66	—	—
1% Cr ½% Mo Pipe	Ferritic	A335	P12	0.15	0.30 to 0.61	0.045	0.045	0.30 Max.	0.80 to 1.25	0.45 to 0.66	—	—
2¼% Cr 1% Mo Pipe	Ferritic	A335	P22	0.15	0.30 to 0.60	0.030	0.030	0.50 Max.	1.90 to 2.60	0.87 to 1.13	—	—
1% Cr 1% Mo ¼% V Pipe	Ferritic	—	—	0.15	0.30 to 0.60	0.035	0.035	0.10 to 0.35	0.80 to 1.20	0.80 to 1.10	—	V 0.15 to 0.25
Ni Cr Mo Valve Body Casting	Ferritic	A217	WC5	0.20	0.40 to 0.70	0.050	0.060	0.60 Max.	0.50 to 0.90	0.90 to 1.20	0.60 to 1.00	Under 0.60 Total
2½% Cr 1% Mo Valve Body Casting	Ferritic	A217	WC9	0.18	0.40 to 0.70	0.050	0.060	0.60 Max.	2.00 to 2.75	0.90 to 1.20	Under 0.50	Under 0.50 Total
18-8 Cb Type 347 Stainless Pipe	Austenitic	A158	P8d	0.08	2.00 Maximum	0.030	0.030	0.75 Max.	12.00 to 20.00	—	9.00 to 13.00	Columbium*

*Grade P8d shall have a columbium content of not less than 10 times the carbon content and not more than 1%.

are for 18 percent chromium, 8 percent nickel type 347 austenitic stainless steel stabilized with columbium as furnished for pipe and covered by Grade P8d in ASTM specification A158-52T. They also are typical of other grades of 18-8 material as furnished for pipe. The cast varieties of 18-8 as furnished in valve bodies and the like do not possess as great high temperature strength as the wrought form furnished in pipe unless alloyed with molybdenum, as in the case with Grade CF10MC of ASTM specification A351-52T.

The high strength of the 1 percent chromium, 1 percent molybdenum, ¼ percent vanadium steel is due to a favorable heat treatment conducted in two steps as follows: (1) hold in furnace for 2 hr minimum in the range of 1875 to 1975 F, followed by air cooling; (2) temper by holding for 12 hr minimum within the range of 1275 to 1325 F, followed by furnace or air cooling. According to reference (9) the high temperature portion of this treatment is intended to produce a substantially complete solution of the alloy-carbides in the austenite. This solution treatment, followed by cooling in air, is said to enable subsequent tempering treatments to produce a pronounced age-hardening characteristic which is held to be of fundamental importance in obtaining good high temperature strength in a vanadium-containing steel.

On the other hand, however, the superior strength of chromium-molybdenum-vanadium pipe when heat treated as described above is associated with low ductility and the possibility of brittle failure. This low ductility, coupled with doubt in some quarters as to the permanence of superior properties obtained through favorable heat treatment over what would exist in the annealed condition, has postponed extended use of such material pending the outcome of further experience with pipe already installed by its sponsors. Some metallurgists contend that vanadium may be a rather tricky addition because it may occur as carbide, as oxide, or as nitride and without adequate process controls, erratic behavior is a possibility.

[Selection of materials for 1100 F steam service, welded joints, valves, and fabrication and inspection are considered in the balance of this paper, to be published later.]

TABLE 2—SPECIFIED MINIMUM TENSILE properties at room temperature for alternative piping steels for 1000 F to 1100 F steam service

ASTM Designation Specification Number	Grade	Tensile Strength Psi	Yield Point Psi	Elongation In 2 Inches % Note 1	Reduction In Area %	Heat Treatment
A335	P11	60,000	30,000	22	—	Note 2
A335	P12	60,000	30,000	22	—	Note 2
A335	P22	60,000	30,000	22	—	Note 2
1% Cr 1% Mo ¼% V		60,000	25,000	15	—	Note 3
1% Cr 1% Mo ¼% V		85,000	55,000	—	—	Note 4
A217	WC5	70,000	40,000	20	35	Note 5
A217	WC9	70,000	40,000	20	35	Note 6
A158	P8d	75,000	30,000	35	—	Optional

Note 1 Standard round 0.505 in. diameter specimen.
2 Hot finished and stress relieved at 1200 F to 1300 F.
3 Normalized or furnace annealed from 1650 F.
4 Held in furnace at 1925 F for 2 hr minimum and air cooled; tempered for 12 hr minimum at 1300 F, followed by air or furnace cooling.
5 Held in furnace at 1900 F for 2 hr minimum; furnace cooled to 1650 and then air cooled; tempered at 1300 F.
6 Normalized from 1750 F; drawn at 1300 F.

TABLE 3—IMPACT PROPERTIES of alternate pipe steels before and after exposure at elevated temperature[a]

ASTM Designation	Grade	Before Exposure	Exposed 1000 Hr 900 F	Exposed 1000 Hr 1050 F	Exposed 1000 Hr 1200 F	Exposed 10,000 Hr 900 F	Exposed 10,000 Hr 1050 F	Exposed 10,000 Hr 1200 F
A335	P11	69	68	66	46	70	55	53
A335	P12	69	68	66	46	70	55	53
A335	P22	73	63	74	71			
1% Cr 1% Mo ¼% V[b]		12		8				
A158	P8d	56	60	55	49	63	51	32

[a]Charpy impact values in ft-lb for full-sized keyhole notch specimens tested at room temperature. Values shown were compiled from references (9, 10, and 11.)
[b]It is characteristic of this steel to have relatively low impact strength at room temperature, see Fig. 14 reference (9). Impact strength at room temperature is improved by tempering to 175-200 Brinell. Value of 8 ft-lb after exposure was obtained from a creep test specimen under load for 2753 hr at 1000 F.

Adopt New Value for Viscosity of Water

THE NATIONAL Bureau of Standards adopted July 1 the value of 0.01002 poise for the absolute viscosity of water at 20 C as the primary standard for the calibration of standard viscosity samples and viscometers.

Previously, the value of 0.01005 poise for the absolute viscosity of water has been used widely as the primary reference standard. The use of the new value of 0.01002 will result in a reduction of 0.3 percent in the measured values of viscosity and will make viscosities reported in absolute units correspondingly more accurate. Previously published data based upon 0.01005 poise may be adjusted to the new standard by reducing the published values by 0.3 percent says the NBS.

HPAC Contractors Learn of

Better Ways To Do Business

— Reports given at the HPACCNA's 64th annual convention are summarized here

THE HEATING, Piping and Air Conditioning Contractors National Association considered the problems of the expanding field its members serve during its record-breaking annual convention, held in Chicago this year. Committee reports, informal panel or round-table sessions, and formal addresses covered better ways of doing business and improved installation procedures.

Overhead Survey Reported

The overhead survey of the business of association members for 1952 was tabulated from questionnaires received from 217 members in 27 states and the District of Columbia, of which 209 were used in the tabulation of the report.

The replies were divided into eight classes according to volume of business reported, the number and type of business organization being shown in Table 1.

The figures show again that the business of the members of the association approximates $1¼ billion as it did in 1951. Again, purchase of materials for the membership can be estimated at approximately $600 million, and the productive pay roll at about $330 million. The quality of credit is high as 203 of those replying stated that they discounted their bills.

The turnover for the 209 concerns whose questionnaires were tabulated is 5.08.

In presenting the figures for operating expense in Table 4, three columns have been added, one showing the number of reports used, another giving the average sales volume for each class, and another giving the average operating expense for each class. Having these averages the contractor can more readily place his own business not only in the class but as above or below the average of the class.

Sees Panel Heating Trend

Peter B. Gordon, chairman of the association's radiant heating committee, said that a two-day meeting of this group had been held which was devoted to a new section on panel heating to comprise a part of the association's Engineering Standards. He said this booklet was to go to press within the next two or three months and that its approach was direct in that it tried to eliminate complicated calculations without avoiding the calculations necessary to get good and economical designs.

He noted an increasing trend toward the use of metal ceilings which permit panel cooling as well as panel heating. With a concrete or plaster ceiling, conditions sometimes require too high a temperature difference between the circulated water and the surface of a ceiling, which forces the use of too low a water temperature when it is desired to employ panel cooling, he said.

He said there was an increasing acceptance of panel heating (which a survey in one area indicated to be 73 percent.) He noted that increasing results of research by the American Society of Heating and Ventilating Engineers were being published and that much dependence was being placed on these ASHVE papers by the HPACCNA committee in compiling its standards.

Boiler-Burner Unit Ratings

According to the report of George P. Nachman, chairman of the boiler output committee, two drafts of the proposed testing and rating code for boiler-burner units were prepared during the past year. The second draft is now in the hands of the committee members and the engineering committee of the Steel Boiler Institute. Progress is definitely being made but not as rapidly as the committee would like, he said, as there are a great number of problems involved.

The association's board of directors has instructed the boiler output committee to include ratings for baseboard units as a regular part of its scope of activity. Plans for this step are now under discussion and the committee invites suggestions and advice on the best method of including this new service.

Piping Standards Approved

Rowland Tompkins reported on the American Standards Association, noting the following actions:

Approval of section 8 on gas pipe line and distribution systems, sup-

TABLE 1—CLASS according to volume of business and type of organization

Class	Volume of sales	No. of returns	Type of Business Organization		
			Corporation	Partnership	Individual
I	Under $100,000	27	9	5	13
II	$100,000 to 249,999.99	36	14	5	16
III	$250,000. to 499,999.99	40	26	9	5
IV	$500,000. to 749,999.99	27	22	3	3
V	$750,000. to 999,999.99	18	15	2	1
VI	$1,000,000. to 2,499,999.99	42	39	1	2
VII	$2,500,000. to 4,999,999.99	15	14	1	0
VIII	Over $5,000,000.	4	4	0	0
	Totals	209	143	26	40

TABLE 2—TOTALS for 209 concerns

Net worth	$ 37,831,347.22
Volume of sales	192,502,388.79
Operating expense	24,902,821.56
Productive pay roll	52,865,342.56
Purchase of materials	89,151,024.59

plement to the ASA Code for Pressure Piping B31.1-1951 as American Standard B-31.1c.

Approval of revised standard for carbon and alloy steel nuts for bolts for high pressure and high temperature service ASTM-A194-51; ASA G38.1-1952.

Approval of standard on cast brass solder joint drainage fittings, ASA B16.23-1953.

Approval of standard on brass or bronze flanges and flanged fittings, 150 and 300 lb., ASA-B16.24-1953.

He said that the Chemical Industry Correlating Committee has under study by a subcommittee the extension of the schedule 5S dimensioning system to cover other pipe materials such as copper, aluminum and nickel alloys and also a new standard analysis of stainless steel for use within the chemical and process industries.

Developing Contract Form

Wray Scott, representing the association's trade relations committee, recommended that this committee expand its efforts. He said that the mechanical specialty contractors wanted to develop a contract form which would be more satisfactory than that offered by the American Institute of Architects or the general contractors and which would be "safe and sound" from the mechanical contractor's viewpoint.

Publicity Valuable

A report on the activities of the Plumbing and Heating Industries Bureau was given by Arnold H. Goelz. Following the report, Joseph P. Baldwin, prominent heating and piping contractor and a former member of the bureau's board of directors, said that "of all the funds the association subscribes for various purposes, there is nothing from which we derive a greater return from our dollars than from the subscription we make to the bureau."

Well-Known Speakers

Several nationally known speakers addressed various sessions of the HPACCNA convention.

Secretary of Labor Martin P. Durkin told the contractors that "productivity is the path to peace and plenty" and said that higher standards of living require greater productivity by both employers and wage earners, for there is no escaping the fact that to consume more we must produce more. One of the ways to meet the needs of higher productivity, said Secretary Durkin, is to add to the supply of skilled craftsmen as quickly as full and proper training permits.

Sound apprenticeship training programs, properly administered to fit the needs of the construction industry generally and the pipefitting industry particularly, are keys to American wellbeing, he stated.

Peter T. Schoemann, acting general president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry, indicated that 50 percent of the jurisdictional disputes and strikes in the building trades were caused by architects, engineers, and general contractors — as specifications and contracts frequently designate the wrong craft because they do not know the jurisdictional rulings of the AFL or the building trades practices in various areas.

Clarence Manion, former dean of law at Notre Dame, was introduced by Howard Spindler of the American Radiator & Standard Sanitary Corp. Dean Manion said that his audience was "only incidentally in the contracting business" and that "everyone's primary business is the Constitution of the United States." He said this was one of the most neglected businesses in America. The Declaration of Independence and the Constitution are the "specifications" on which the United States rests, he said — just as a hotel, such as the one in which the meeting was held, rests on its plans and specifications. He quoted George Washington in likening government to fire — which is a "dangerous servant, but a fearful master." He said we have drifted far from this concept of government.

Albert J. Nesbitt, president of John J. Nesbitt, Inc., was introduced by James Anderson as an outstanding citizen of Philadelphia in business, in civic affairs, and in religious work. Mr. Nesbitt reminded his hearers that he had attended his first heating and piping contractors convention in 1924 and that he had learned then "never to underestimate the power of the contractor." He devoted his remarks to discussing the integrity of manufacturer-contractor relationships and said that the integrity of a manufacturer's pricing and sales policies was a very important factor in this relationship.

At the concluding session of the convention, Fred Smith, vice president of the William Powell Co., discussed the importance of personality in selling. He stressed the following points: (1) Sell yourself — then your product. (2) Sincerity is essential. (3) Be easy to talk to. (4) Have a positive instead of a negative attitude. (5) Improve your communications. (6) Be self-motivated. (7) Don't criticize unless you have something better to offer.

New Officers, Directors

Robert W. Lawinger, president of the S. J. Reynolds Co., Chicago, was elected president of the national association, succeeding William W. Murray, Jr., head of Almirall & Co., of New York.

The new HPACCNA vice president is J. DeWitt Morrow, president of the Warren Co., Houston. Succeeding him as treasurer is Herman W. Goldner, president of the Herman Goldner Co., Philadelphia.

A total of 862 attended the convention, the largest in the association's history. Delegates representing a nation-wide membership of 1200

TABLE 3—TURNOVER or ratio of volume of sales to net worth

Class	I	II	III	IV	V	VI	VII	VIII
Ratio	2.4	3.6	3.5	5.5	4.8	4.7	6.9	6.0

TABLE 4—OVERHEAD (operating expense: average for class and percent to sales and to cost)

Class	No. of reports	Average sales volume	Operating expense: Average operating expense	Operating expense: Percent To sales	Operating expense: Percent To cost
I	23	$ 70,339.11	$ 15,766.17	22.41	32.24
II	32	171,528.10	30,963.54	18.05	23.82
III	38	360,174.93	59,210.68	16.44	21.45
IV	27	642,258.47	101,089.36	15.74	19.78
V	17	894,197.75	119,919.02	13.41	16.47
VI	41	1,518,015.05	194,645.50	12.82	15.61
VII	14	3,085,120.48	304,962.63	9.90	11.59
VIII	4	6,377,559.26	731,497.96	11.08	13.01

mechanical contractors from 40 local associations voted to increase the board of directors from 15 to 18.

Serving the national association as newly elected board members, for three year terms, are Frank V. McBride, Paterson, N. J.; William P. Scott, Jr., San Francisco; Joseph H. Spitzley, Detroit; and Horace E. Wetzell, Cleveland. Carl S. Fischer, Memphis, was elected to the governing body for a two year term, and George J. Johnstone, Minneapolis, was named to the board for a one year term.

The newly elected board of directors met immediately after the convention adjourned and completed its organization. Carrying out the program adopted by the members at the executive session, it voted Secretary Joseph C. Fitts a leave of absence until October 10, 1954, and selected Assistant Secretary Lloyd B. Gruman, Jr., to serve as acting secretary during the leave of absence.

R. D. Berry Honored

The association's distinguished service award was given to Raymond D. Berry, president of Gallaher & Speck, Chicago. Mr. Berry is president of the Building Construction Employers Association of Chicago, chairman of the Joint Arbitration Board of the Chicago Association and the Pipe Fitters' Association, Local No. 597, United Association, secretary and a director of the National Certified Pipe Welding Bureau, and chairman of the administrative committee of the Heating, Piping and Air Conditioning Contractors Chicago Association.

Atlantic City Next Year

The association's 65th annual convention is to be held at the Hotel Traymore, Atlantic City, May 24-28, 1954.

[A story in the July HPAC summarized discussions at the HPACCNA convention of the expanding air conditioning market, the air conditioning panel session, report of the welding committee, the pipe welding bureau, and the welding round-table or panel session.]

AIR CONDITIONING has reached the service station. Motorists suffering from the summer heat can relax in comfort while their cars are being serviced

Service Stations Offer "Free Conditioned Air"

THERE WAS A TIME when service stations advertised "free air" to motorists — meaning air for your tires. Now it's a service which is taken as a matter of course.

There's a new twist to it today. Some service stations are now offering a free "shot" of conditioned air, as was noted briefly in the July HPAC.

The Continental Oil Co. is currently testing four of these air conditioning installations. Two are at neighborhood stations in Houston, one at a highway station at Orange, Tex., and the fourth at a highway station at Galveston. Approximately 50 percent of the business of the Orange and Galveston stations comes from tourists. The two different types of stations were thus chosen to determine whether the air conditioning at one type of station holds more customer appeal than at the other. Banners, parking sign inserts and postcard-size souvenirs were used as promotional material. At Orange and Galveston, 24-sheet outdoor poster boards a few blocks from the stations were designed to stop the tourists.

Because the test has been running only a few weeks, no conclusive results are available yet to give a true picture of the scheme as a sales stimulator. Sales figures at the stations will be analyzed following the summer months.

The customer reaction has been excellent, according to Continental. Many strangers visit the stations out of curiosity, inquire about the air conditioning units and purchase gasoline. One customer said: "I've seen a lot of service, but this tops them all."

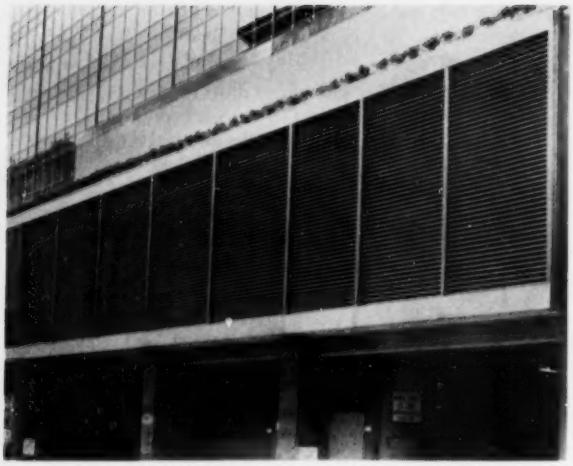
The reaction of the service station operators has been good, although they are waiting to see how their total summer sales are affected. The operators' only complaint is that the unit is a little on the bulky side and somewhat awkward to handle. The operators are all for it, if the sales justify the cost.

The 3 ton portable air conditioning unit reduces the temperature within a car as much as 20 deg in two minutes, Continental says. It makes three complete air changes per minute in an average car and can discharge as much as 600 cfm of filtered air into a car, handling two cars simultaneously. The nozzle fits in the window and adjustable vents direct cool air away from motorists.

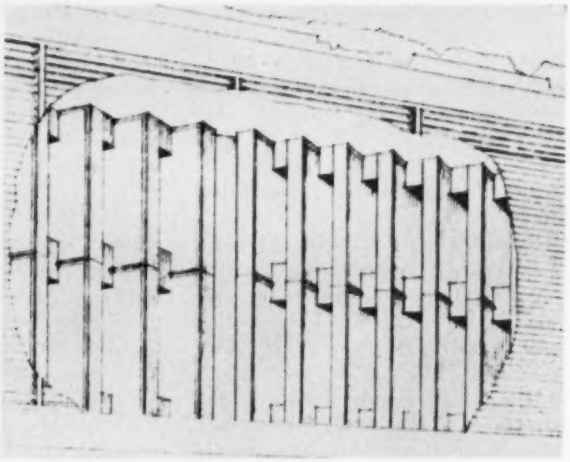
Attached to the unit's plenum chamber are two 8 in. flexible hoses, damper controlled. There are two diffusers on each hose.

Arc Welding Award Program Announced

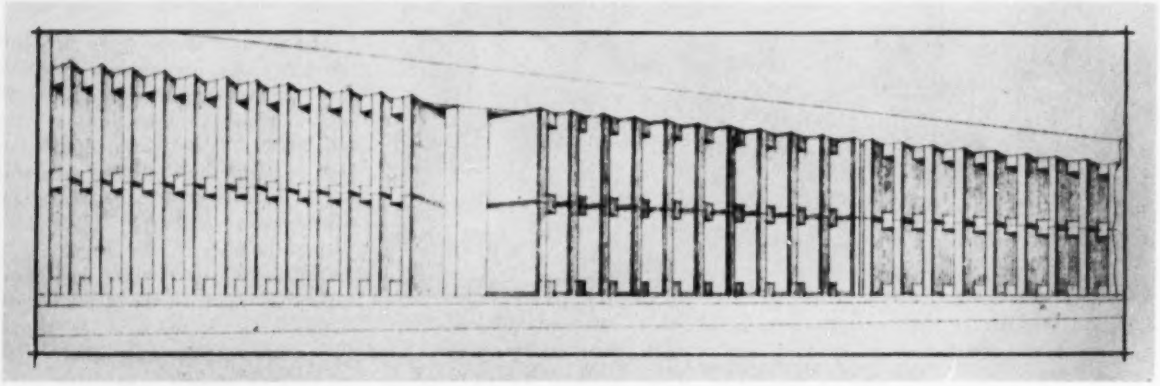
THE JAMES F. LINCOLN Arc Welding Foundation, Cleveland 17, has announced a $13,500 arc welding award program for selected business and service establishments. Awards will be made to individuals in businesses and service establishments such as bakeries, dairies, hospitals, hotels, food manufacturers, buildings, municipalities, cemeteries, printing plants and newspapers, for describing the use or possible use of arc welding in the maintenance, operation or services performed by the business.



THE ALUMINUM AIR INTAKE louver at Lever House is a big one, measures 70 ft by 15 ft



HERE'S HOW THE BAFFLES and resonators for absorbing sound were installed behind the intake



FROM THE REAR, the silencing system looks like this. The louver faces 54th St.

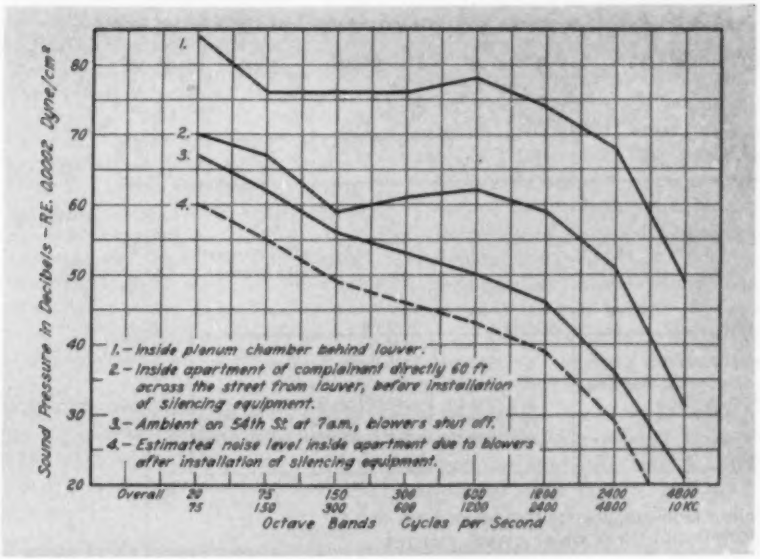
How Air Intake Was Silenced

Fan noise from the large intake air louver at Lever House annoyed some of the neighbors. A silencer constructed of acoustic baffles solved the problem

By Martin Hirschorn
President
Industrial Acoustics Co., Inc.

AT LEVER HOUSE — the new 24 story glass and stainless steel building on Park Ave., in New York City — an average volume of some 200,000 cfm of free air is drawn in through one of the largest air intake louvers in existence. The intake — on the second floor of the building, facing 54th St. — measures approximately 70 ft in length by 15 ft high. A little less than 6 ft behind this aluminum louver are the seven high pressure blower systems which circulate air for conditioning the building.

The noise created by these blower systems disturbed the tenants in the apartment building across the street, about 60 ft away. As a result, a silencing system has been constructed for this very large air intake opening, measuring more than 1000 sq ft in cross section. The only silencing systems comparable in cross sectional area have been



A NOISE LEVEL SURVEY was made. Complaints ceased after the silencing installation

THE BUILDING is entirely dependent on its air conditioning

built for use with jet engine test cells for the aircraft industry, where the largest air intake openings measure approximately 900 sq ft (though the quantities of air handled are considerably larger than at Lever House.)

Silencing System Designed

The design of the silencing system involved a number of problems because of the small space available inside the plenum chamber. It was essential to leave a minimum 24 in. clear passage throughout the chamber in order to assure accessibility to the blower systems. Accordingly, only 48 in. was available for a silencing system to give the required noise reduction. Pressure drop, although a very important consideration, did not present a serious problem in this case because of the low air velocities through the louver. Also, the silencing system took away less than 50 percent of the cross sectional area of the intake opening, which is equivalent to approximately the free area of the louver opening.

The problem was solved by the design of an air intake silencer constructed of high frequency and low frequency acoustic baffles fabricated of perforated metal and sound absorbing materials of suitable density and thickness. The general principles involved in the solution of this problem were described in an article in the August 1952 HPAC [Silencing Cooling Towers, by Martin Hirschorn.]

Noise Level Survey Made

Before proceeding with the design of the silencing system, a noise level survey was undertaken. The results are shown in the accompanying curves.

Curve No. 1 shows the noise spectrum inside the plenum chamber. Curve No. 2 shows the noise distribution inside the apartment of a complainant approximately 60 ft across the street, before installation of the silencing system. Curve No. 3 represents a typical ambient spectrum, on 54th St. at 7 a.m., and Curve No. 4 indicates the estimated noise spectrum due to the blowers after completion of the silencing system.

It was impossible to measure this curve because the ambient never dropped below Curve No. 3 when the sound level measurements were taken. However, the estimate that Curve No. 4 must be well below the ambient is borne out by previously complaining residents who have said that the air conditioning blowers must have been shut off, since it is impossible to pick up any sounds from them. Actually, the blowers are operated throughout the year, as the building is entirely dependent on their use.

Navy's New Carriers To Be Air Conditioned

BOTH OF THE NAVY'S new aircraft carriers, the U.S.S. Forrestal and the U.S.S. Saratoga, will be air conditioned, according to Carrier Corp.

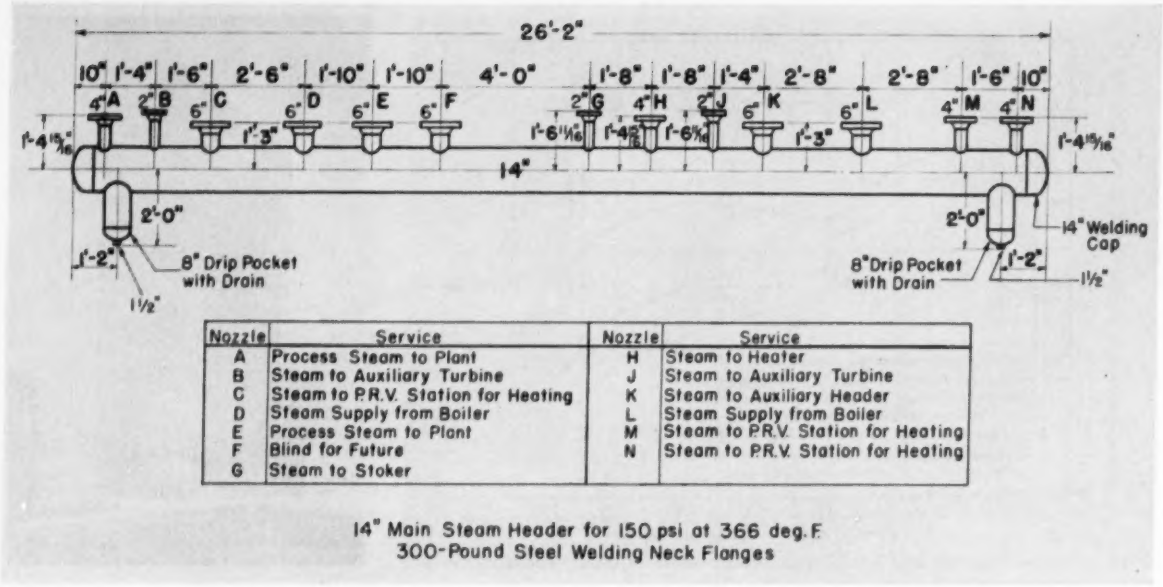
Six centrifugal cooling machines will be installed in each of the carriers to handle the air conditioning, and seven reciprocating units will take care of ships' stores refrigeration and the cooling of drinking water.

The twin carriers will be the largest fighting ships ever built.

Studies Unusual Corrosion Problem

SAM TOUR, general manager of Sam Tour & Co., Inc., has been retained by the Icelandic government to investigate an unusual problem — preventing corrosion in municipal heating systems which derive their heat from underground hot water springs.

Many homes and buildings in four of Iceland's major communities, including the capital, Reykjavik, are heated with hot water pumped from underground springs. The water has an average temperature of 190 F.



Nozzle	Service	Nozzle	Service
A	Process Steam to Plant	H	Steam to Heater
B	Steam to Auxiliary Turbine	J	Steam to Auxiliary Turbine
C	Steam to P.R.V. Station for Heating	K	Steam to Auxiliary Header
D	Steam Supply from Boiler	L	Steam Supply from Boiler
E	Process Steam to Plant	M	Steam to P.R.V. Station for Heating
F	Blind for Future	N	Steam to P.R.V. Station for Heating
G	Steam to Stoker		

14" Main Steam Header for 150 psi at 366 deg. F
300-Pound Steel Welding Neck Flanges

1 MAIN STEAM HEADER at industrial plant comprises an efficient "central switching and control station"

2 THE SAME HEADER as it looked prior to its installation. Thirteen outlets are contained in a 26 ft, 2 in. length

Plan Piping Headers for Ease of Operation

By G. W. Hauck

Piping is transportation. Most of it needs controls and that usually involves headers. . . . . Headers which are well designed for complete control at one central point and which are also located to provide comfortable and quick operation are bound to reflect economies and promote safety. . . . . And — the operators will live cheerfully at work because the heart of the piping system is good and it's easy to operate.

YOU CAN LIVE cheerfully with a good piping system if it's easy to operate. But what makes a piping system good? How do you make it easy to operate?

Piping Is Transportation

You can define a piping system simply — it is a form of transportation. It is a means for getting liquids and gases from one point to another. Sometimes, even solids are moved through piping systems.

You might enlarge upon this theme of transportation by considering the similarity which exists between piping systems and the trackage of a railroad system. A piping system uses various types of fittings which direct flow—these suggest the switches of a railroad. Valves are used to stop, start or control flow and perhaps there is an analogy in the brakes and throttle which control the movement of a locomotive.

Control Points Needed

A railroad needs central switching stations in order to control the direction and movement of cars at central points. In like fashion, you need central switching and control stations for many piping systems. *Headers are a prime example.* This idea of a "central switching and control station" should be present in the forefront of our reflections not only when designing but also when locating headers.

These two principles can be amplified by considering some details of an actual installation.

Example—A Header

Fig. 1 is a sketch of the main steam header which was installed recently in the boiler house of an industrial plant. While it is not a high pressure power plant, that doesn't eliminate the need for careful thought and planning. Saturated steam is generated at 150 psi solely for processing work and for heating. This plant is typical of many where steam is used for a variety of services in different sections of the property.

Such headers become efficient central switching and control stations and provide economies in operation if they are well designed and thoughtfully located. These two elements — design and location — are important; together, they have a lot to do with determining how good the piping system is and if it's easy to operate.

Flow Through Header

Reference to Fig. 1 and its legend shows that this 14 in. header is supplied with steam from two boilers at nozzles *D* and *L*. Process steam exits from nozzles *A* and *E* for two different buildings. Steam for heating is piped from nozzles *C*, *M*, and *N* to three pressure reducing valve stations. Nozzles *B*, *J*, *G* and *H* provide steam for services within the boiler house proper — turbine driven boiler feed pumps, stoker and heater.

The design wisely provides for the future by including a spare 6 in. nozzle (*F*) with a blind flange. Nozzle *K* provides steam for an adjacent building where it is connected to an auxiliary header (discussed in more detail later.)

Details of Header Design

Fig. 1 reflects a header design which is an adequate central switching and control station, yet is streamlined effectively — 13 outlets are compactly contained in an over-all length of 26 ft, 2 in. Each nozzle of this header is fitted with a gate valve. Thus, the flow of steam for varied services and in scattered sections of the property is controlled at one central place.

Steam for processing is required the year 'round (except for most weekends.) Steam for heating is required only during the heating season, but then around the clock. It is apparent, therefore, that having separate valved outlets for these diversified services provides effective and economical control in one spot, as it should be.

The different sizes of welded nozzles have varying center to face dimensions in order to put the center of all valve stems and handwheels on a common center line. This happened to be the preference of the plant's chief engineer and results in an eye-pleasing arrangement of all valves in a row and on a straight line.

So much for design details. The engineer agreed readily that the location of this header was another important item in planning. Let's look at this matter of location.

Location of Header

A good header is the heart of a plant's piping. If it is to be a good control station, easy accessibility is important. With this in mind, the header was put in the boiler house and located adjacent to one wall just a few feet above the operating floor. This location puts all valves at a convenient level for comfortable operation from the floor. You don't have to climb ladders or stairs to a catwalk in order to operate any valve. The result: It's easy to operate the main steam piping controls.

Header Drainage

Since the header is located at the low point of the steam piping system, it is not difficult to provide adequate means for the removal of condensate. An 8 in. welded drip pocket is located near each end of the header. The tapped bottom outlets are connected to individual steam traps. Thus some other controls which have a bearing on good operation are conveniently located, are visible, and contribute their bit toward making it easy to operate the piping system.

In Fig. 2 you see a photo of the header as it looked prior to its installation. The picture amplifies some of the details of Fig. 1.

Auxiliary Steam Header

The two principles which have been emphasized — good design and good location — were also applied to an auxiliary header.

A building which adjoins the boiler plant contains steam driven auxiliaries — an air compressor and several pumps which handle water and oil. The steam supply for this equipment comes from nozzle *K* of the main header Centralized control of individual steam flow to these auxiliaries plus ease of operation were adopted as two essentials. So, the

Mr. Hauck is Manager, Engineering Sales, Crane Co., and is a member of HPAC's board of consulting and contributing editors.

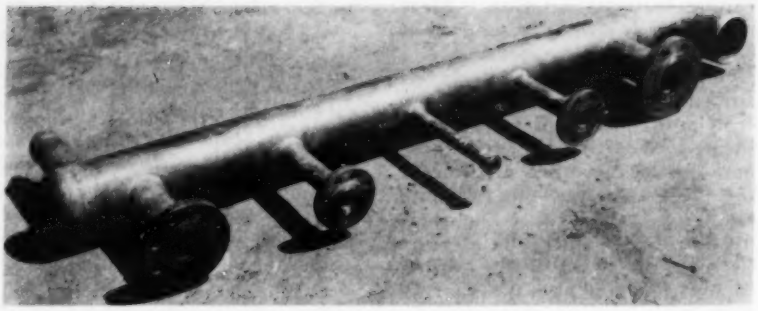
situation here is identical to that in the boiler plant (except that it is smaller in scope.) Hence, the same techniques of design and location were followed and the obvious answer was an auxiliary header.

Auxiliary Header Details

Fig. 3 is a photo of this auxiliary header. It is 6 in. in size and 7 ft, 3 in. in over-all length. The steam supply connects to the welding elbow at one end. Steam is distributed through two 2 in., one 3 in. and one 4 in. flanged nozzles, and one 1¼ in. threaded nozzle.

All valve stems and handwheels are on a common center line. A 3 in. welded drip pocket near the far end takes care of condensate through a steam trap.

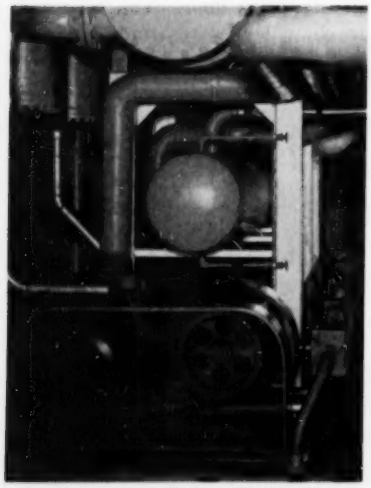
As in the case of the main steam header, this auxiliary header is adjacent to one wall and just a few feet above the floor — in order to achieve the maximum ease of operation and control.



3 AUXILIARY HEADER at the same plant was designed and located according to the same principles

Air Conditioning a "Must" for Self-Service Store

By William V. Mauer, Sales Manager, Schnacke, Inc.



FIVE 60 TON COMPRESSORS, installed in a compact space, provide chilled water to the air handling units on the various floors

A 300 TON YEAR 'round air conditioning system is an integral part of the "Evansville Store", in Evansville, Ind. This department store, one of 44 such stores operated by Interstate Stores, Inc., of New York City, employs "self selection" merchandising. The building was therefore designed to "expose" its customers to the most goods under the most favorable conditions — with air conditioning a design "must".

Each of the six floors is divided into two zones, served by individual, suspended, air handling units supplied with chilled or heated water piped to all floors and circulated at constant volume. Zone thermostats control the flow of water through the coils in the units.

The hot water for heating, provided by city steam piped to a heat exchanger, is handled by separate pumps.

Five 60 ton compressors are piped to a common condenser, cooled by a roof-located water tower. The compressor units provide "integral unit" capacity control in steps of 20 percent. The temperature of the water supplied by the multi-circuited dual chillers operates a potentiometer type thermostat. This in turn operates a step control that cuts in one to five compressors, as needed, with an interval delay of 30 sec. This delay, along with the unloaded start, permits the handling of wide swings in load without objectionable power line surge.

The engine room installation is compact, using nearly 50 percent less space than was originally alloted to it. This extra space was released for sales purposes.

The compressor control circuits are set so that the "lead" compressor is rotated on a weekly basis to equalize operating hours.

The Interstate company's concept of mass merchandising by "self selection" is to induce people to linger longer — and expose themselves to more sales. A "must" in such a plan is air conditioning. Particularly in the summer months, when department store business tends to slide, it is necessary to have the store so conditioned that people will feel comfortable, stay longer and hate to leave.

Short Course Covers Commercial Heating

PROFIT POSSIBILITIES for contractors in designing heating systems for small commercial, industrial and institutional buildings in accordance with the latest methods were emphasized at the seventh annual short course on hot water and steam heating systems at the University of Illinois, Urbana. The students learned how the IBR installations guides, although intended for small jobs, can be applied to larger jobs. They learned how by means of zoning, larger jobs can be handled as multiples of a small job. Classroom problems included designing a baseboard heating system and a panel heating system for a motel, design of a heating system for a school, and design of a heating system for a 12 room addition to the school. Students also worked out the problem of designing a snow melting system for the parking area of a motel.

The course was conducted by the department of mechanical engineering of the university in cooperation with the Institute of Boiler and Radiator Manufacturers.

Meeting Varying Needs for Air Conditioning

Some areas in new ball bearing plant require careful temperature, humidity control

By J. Mason Brown and M. Y. Huyett
Wigton-Abbott Corp. and Carrier Corp., respectively

AIR CONDITIONING is an important feature of the Marlin Rockwell Corp.'s new $3 million plant at Falconer (near Jamestown), N.Y., for the manufacture of ball bearings for jet engines, high speed machine tools, precision instruments and other critical applications.

Two Main Areas

The plant's net operating area is approximately 80,000 sq ft. When considered from the standpoint of air conditioning, this area was subdivided into two main areas.

The first zone — comprising about 16,000 sq ft or 20 percent of the total, includes such critical areas as assembly, gage rooms, washing and wrapping operations.

These operations should always be carried on in closely controlled conditions in order to eliminate dust and prevent foreign matter coming in contact with the highly finished bearing parts; to eliminate the corrosive effects of perspiration; to insure consistently accurate results in gaging and assembly, which would vary without temperature control; and to promote employee efficiency.

The remaining 80 percent of the space consists of manufacturing area, and for purposes of design, also includes the cafeteria, locker rooms and laboratories.

In manufacturing ball bearing components, it is not essential that temperature and humidity conditions be controlled to within definite limits, as in the case of the assembly rooms and gage rooms and for washing and wrapping operations.

There are, however, several factors involved in the manufacturing area which require that some treatment be provided. First, the internal load is high mainly due to the heavy concentration of motors. This condition, if not relieved in some way, would undoubtedly result in decreased employee efficiency. Second, ventilation requirements, because of exhaust systems and oil fumes, are inherent in manufacturing processes of this sort. Third, sudden changes in temperature can adversely affect the operation of the equipment involved — so that while definite limitations are not required, it is important to maintain a constant temperature level over any given period of time.

Three Methods Considered

A study was therefore made of various methods of treating this area. Three different systems were considered:

1) Straight ventilation.
2) Evaporative cooling.
3) Cooling with mechanical refrigeration to offset internal loads.

It was concluded that a straight ventilation system would require extremely large quantities of air in order to prevent the inside temperature from becoming excessive. This large volume of air, in comparison with the other systems, brought about a high initial cost and still did not provide satisfactory inside temperatures.

The evaporative cooling system resulted in a slightly lower first cost than the ventilation system but resulted in a humidity condition which was considered too high.

Cooling with mechanical refrigeration to offset internal loads was concluded to be only slightly higher in first cost than evaporative cooling. The optimum inside design conditions arrived at are 90 F and 40 percent relative humidity with outside design conditions of 93 F dry bulb and 73 F wet bulb. This condition does not represent the ideal of 80 F and 50 percent relative humidity but is a considerable improvement over the other methods.

It was decided to use this system.

It provides adequate ventilation and low humidity — which, while not critical to the manufacturing process, results in a more comfortable condition. Since the cost is only slightly higher, it is felt that the additional money is well invested.

Area Divided Into Zones

In the manufacturing area the varying concentration of heat loads — due to arrangement of production machinery, use of exhaust systems and the possibility of future installation of additional machinery — called for dividing it into multiple zones. Flexibility to shift the refrigeration load to areas where required and to hold an overall even temperature throughout the space is thus obtained.

The air handling equipment comprises standard ceiling type, factory assembled, air conditioning units.

Insofar as possible, these units are of the same size for interchangeability of motors and parts. It is interesting to note that the overall cost of this multiple zoning was not greater than that for a central station system, as the additional cost for a penthouse, more structural steel, etc., and the increase in duct size, would have offset any savings in the use of the central system.

Ventilation air is introduced separately to each unit and, in this way, air supply to a zone and air exhausted from it is balanced and a minimum of air movement from one part of the plant to the other will occur. Thus, oil fumes from production machines are isolated in the particular zone. Each zone has its own outdoor air intake duct, tempering coil, outdoor and return air dampers and temperature controls.

A 500 ton centrifugal refrigeration machine, motor driven, supplies cold water which is pumped to the various zone units in the manufacturing area. The water is delivered at a constant temperature with the varying loads being automatically handled by the compressor. A spray pond supplies condenser water for this machine in addition to the cooling water for the removal of heat from the various coolants used in the manufacturing process.

Although condenser water, the chilled water, and the water for the coolant are required in different quantities, it was discovered that because of the various head pressures required, one size pump would meet all three conditions. In view of this, one standby pump serves all three of these pumps.

Improves Power Factor

It was found that the inductive type electrical load in the plant resulted in a very low power factor. It was therefore decided to drive the centrifugal compressor by means of a synchronous motor with an 0.8 leading power factor equipped with a detachable coupling which provides for continuous operation of the synchronous motor. This motor, by pumping reacting power into the electrical system, gives a high enough overall power factor to practically offset power consumed by the refrigeration machine.

Compressor Control

It was realized by the designing engineers that the owners would probably want to operate the system for this area to maintain as low a temperature as possible. (Although the design conditions call for maintaining 90 F, this is considerably above comfort conditions.) Should this be done, it was conceivable that the centrifugal machine which was selected for design conditions would be overloaded. To prevent this overload of the motor and subsequent shutdown, it was decided to throttle the suction damper and permit the temperature of the water leaving the machine to rise.

Three points from which the control device could be actuated were suggested: 1) the chilled water temperature entering or leaving the machine; 2) the suction pressure; and 3) the power input to the motor.

Theoretically, each of these would achieve the results desired, but it was finally decided that control by the power input to the motor would result in definite advantages. This method of control is accomplished by having a float action relay connected directly to the motor which reacts to the current input. This relay in turn actuates a motor driven air switch which bleeds air into or out of the suction damper motor on the compressor.

With this type of control, the advantage of lower condenser water temperature can be utilized, higher tonnages can be maintained at higher temperature levels, and it automatically responds to changes in the fouling factor. Most important, however, is that the control meets the problem at its source — namely, the motor.

The Precision Area

The precision area — consisting of the gage rooms, ball inspection, assembly washing and wrapping — is to be maintained at 74 F dry bulb temperature and 45 percent relative humidity the year around.

This area did not require any special study, as the design conditions were fixed. In spaces of this sort, it is essential to maintain careful control over temperatures and humidities as changes in conditions have an adverse effect on the close tolerances involved in precision ball-bearing assemblies. The ball bearings being assembled in this area are subject to the strictest specifications set forth by the Anti-Friction Ball Bearing Manufacturers Association (Specifications A, B, E, C, 5 and 7).

The equipment selected to perform this function consists of central station type apparatus with direct expansion coils, water sprays, and viscous type washable filters supplemented by electrostatic filters. The temperature control in each of the rooms is maintained by means of independent steam reheat coils. The humidity — not being as closely controlled — is maintained by a humidistat controlling the capacity reduction of the two "Freon" reciprocating compressor units, broken down into eight steps. Use of duplex compressor units allows for flexibility of control and for partial operation in case of mechanical failure.

Seven Miles of Piping

There are over seven miles of piping required for cooling water, chilled water, steam, coolant, air, etc. The soluble oil coolant system uses both the flotation method and the pressure filter method for cleaning. Both the receiving and the shipping truck ramps have embedded pipes with anti-freeze solution circulated for snow removal.

This modern single story structure with all its services was designed and is being erected by the Wigton Abbott Corp., engineers and contractors, Plainfield, N. J.

SAM LEWIS' PAGE

Basementless Buildings Pose Practical Heating Problems

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

WE ARE IN AN era of single-story buildings without basements. The tendency is to lay a concrete floor directly on the ground, in many cases to make the walls mostly of glass, and to use a very thin roof without any attic or suspended ceiling. The engineer then is asked to design a plant that will ventilate, heat and cool the building — without any place in the building where the distributing pipes and ducts may be effective, yet apparently be absent.

If we locate a service pipe in an inaccessible space such as that between joists above lath and plaster, eventually someone will need to find that pipe — and well may censure the design.

No Friendship for Designer

If the service pipe is placed in a little tile duct, or is buried under concrete of the floor, it is certain that eventually the fellow who must hunt for a leak will not have a concrete friendship for the designer.

Sometimes we may use steam convectors equipped with fans, served by supply and condensate mains near the ceiling. Sometimes we employ mechanically circulated hot water, with radiators or convectors near the floor along the cooler walls, served by flow and return mains overhead. This is a hopeful solution for a single-story basementless school room. There are considerations in favor of systems with overhead air supply ducts, when owners and architects try to make heating engineers design plants with inadequate space for vital piping services.

Occasionally the problem is complicated by the necessity for drainage of condensate from steam heated unit ventilating machines, such as are used in many educational classrooms. The conventional answer with such plants is to place the return mains, at least, in a masonry-lined trench along the outer walls. The trench should of course be wide enough and deep enough to allow a service man to crawl along. Such trenches rarely are cleaned. They acquire debris and dust and are an unsatisfactory substitute for a basement or for a crawl space. They are a happy haven for rodents.

Piping Insulation Damaged

A large suburban high school, which is located unfortunately as to site drainage, has perimeter trenches of concrete as a substitute for a self-respecting basement. The average trench cross section is 4 ft wide and 3 ft deep. In it are two steam mains at two different pressures, hot water flow and return mains, and a vacuum condensate return main.

Owing to the small trench, the contractor was allowed to apply the pipe insulation through several hundred feet of trench, before the concrete trench cover, which is also the first floor of the building, was built. A few weeks later, before the boilers were ready to furnish steam, a cloudburst overfilled the sewers. The water and mud backed up into the building and submerged the trenches.

The insulation was badly damaged and is developing a magnificent growth of plant life. The cost of repairing and renewing and repainting all this insulation in those constricted places will be appalling. No small part of the matter is that the accident easily can recur.

I am more than ever against inadequate trenches for heating services. I am also of course against inadequate sewer systems. I am against permitting any insulation to be installed until after the piping has been tested under the temperature and pressure of the ultimate operating conditions.

I'm for Intestinal Fortitude

I am not against the designer of heating systems who has sufficient intestinal fortitude to forfeit a commission or alienate a client when the client insists on trying to live with an obese system of service pipes in an emaciated space for the pipes.

READER ASKS —

How Much Does Air Conditioning Boost Office Efficiency?

THE QUESTION, How much does air conditioning boost worker efficiency, productivity?, was asked in a recent issue.

Like the reader asking the question, we also are interested in any data or information along these lines; or any references where we might find such information.

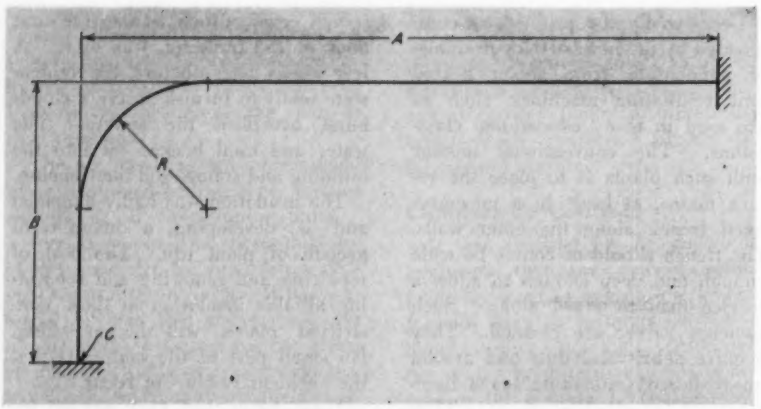
We are particularly interested in the effect that air conditioning — or the lack of it — has on the efficiency or productivity of office workers. We will appreciate any information.—P. E. H.

You are invited to answer this question. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

"Not So Simple After All"

Plant piping problem not quite as easy as Martin MacVane explained it to his friend, Herman Shultz, Chief Engineer

By P. I. Ping



1 DIMENSIONS of steam line sketched here are given in Table 1 and the five cases are analyzed in the text and the following tables

The author, an experienced piping engineer, has contributed the following solicited comments in order to "keep the record straight." However, he writes under a nom de plume since he feels that there is no point in introducing his company affiliation in a matter of this kind.

MARTIN MACVANE, gasket salesman and hero of Bill Dopp's series "Anything Can Happen," gave some rather questionable advice to his friend Herman Shultz, Chief Engineer for the "Southern Food Products Co.," in the article "It Looked So Simple" in the July HPAC.

The bulk of the trouble is found in the series of fast passes which somehow reduces 2.4 in. of actual piping expansion down to 0.8 in. to be accommodated. "Mac's pencil moved rapidly as he talked" reminds one of the shell game in which the hand is quicker than the eye; however, in this case it is the mouth which was quicker than the ear.

Mac advises Herman that substituting an elbow for the bend and using 50 percent cold spring will take care of his troubles, arguing as follows: Motion of 1.4 in. will not cause bending stress in the modified configuration to exceed the allowable value of 8700 psi. Use of 50 percent cold spring permits reducing 2.4 in. of actual expansion to a value erroneously given as 0.8 in. Thus — according to Mac — the problem is solved.

TABLE 1 — DIMENSIONS OF STEAM LINE shown in Fig. 1

Case	A	B	R
1	40′-0″	17′-9¼″	4′-0″
2	40′-0″	16′-3¼″	4′-0″
3	40′-0″	16′-3¼″	6′-0″
4	40′-0″	16′-3¼″	0′-9″
5	40′-0″	16′-3¼″	(Square Corner)

Dimension A for Case 1 should have been taken as 38 ft, 0 in. This information was not available when the calculations were made.

Five Cases Analyzed

Indeed, while "it looked so simple," it actually isn't. For purposes of the present analysis, five cases have been selected, the dimensions tabulated in Table 1 referring to those shown in Fig. 1.

Case 1 represents the "old" boiler lead with the 4 ft radius bend. Case 3 represents the "new" boiler lead with the 18 in. shorter vertical rise and 6 ft radius bend. Case 2 has been included as sort of a link between cases 1 and 3, permitting separation of the effect of the 18 in. change in rise and the 2 ft change in radius. Case 4 represents Mac's proposed solution employing a welding elbow. Case 5, based upon a square corner approximation, is included for purposes of comparison.

The present analysis presumes perfect fixity at the ends of the line as illustrated; that is, it neglects any flexibility in the gate or angle stop-check valves and in the superheater header itself and in the main steam header. Furthermore, it neglects any thermal motions which its ends may themselves experience. The analysis makes use of a bend flexibility factor

$$k = 1.65/h \text{ (but not less than 1.0)}$$

and a bend stress intensification factor

$$i = 0.9/h^{\frac{2}{3}} \text{ (but not less than 1.0)}$$

where

$$h = 4tR_B/(D_o - t)^2$$

D_o denotes the pipe outside diameter, t the pipe wall thickness, and R_B the bend center line diameter. These formulas are included in Chart I of a Report of Task Force on Piping Flexibility, ASA Code for Pressure Piping, ASA B31.1, dated May 4, 1953. (More will be said about this report later in this discussion.) These flexibility and stress concentration factors do not differ very significantly from those given years ago by Hovgaard, except for very sharply bent, thin wall pipe. Their use is in agreement with the provisions of paragraph 620(c) of the present edition of the ASA Code for Pressure Piping B31.1-1951 which were not modified by the recent issuance of Supplement No. 1 (ASA B31.1a-1953).

In making the calculations, an ex-

pansion factor of 6 in. per 100 ft was used, as in Mac's analysis. Also the value of I was taken to be 28.1 in.[4]

Using the present provisions of the ASA code, the allowable combined stress due to combined bending and pressure is

$$S_C = \tfrac{3}{4}(S + S_h)$$
$$= \tfrac{3}{4}(10{,}700 + 12{,}000)$$
$$= 17{,}025 \text{ psi}$$

for seamless Grade A pipe (ASTM A-53 or ASTM A-106). Clearly it is Grade A pipe which is under consideration, since the value $S = 8700$ psi (*not* pounds) cited by Mac is an old (outdated since the fall of 1951) stress value applying to (silicon killed) seamless Grade A pipe. The longitudinal pressure stress, computed allowing 0.065 in. corrosion and average wall equal to nominal, is 2785 psi. Thus, the permissible bending stress is

$$S_B = 17{,}025 - 2785$$
$$= 14{,}240 \text{ psi}$$

Moments, Stresses Tabulated

Table 2 shows reaction forces and maximum bending moments and bending stress calculated for each of the five cases. In each case, the maximum bending moment occurs at the foot of the riser (point C in Fig. 1), and even though there is a stress intensification factor of 2.266 which applies to the 9 in. radius elbow in Case 4, the maximum bending stress also occurs at point C in each case.

Two values are given for each tabular entry in Table 2. Those in **bold face** were calculated using a modulus of elasticity $E = 30{,}000{,}000$ psi for room temperature conditions. Those in light face were calculated using $E = 25{,}000{,}000$ psi for elevated temperature conditions. The final column of figures in parentheses have values two-thirds as great as those immediately preceding and account for full credit for cold springing.

Code Requirements Met?

The last two columns are of interest under present ASA code requirements showing computed stress without and with credit for cold spring. The cases and subcases which satisfy the letter of the present ASA code may be quickly determined by comparing with the permissible value 14,240 psi. The comparison is indicated in Table 3.

TABLE 3 — ARE REQUIREMENTS of present ASA B31.1 code satisfied?

Case	Without Cold spring	With Cold spring
1	No	Yes
2	No	Yes*
3	No	Yes*
4	No	Yes
5	No	Yes

*Actually these two entries would be "No" based strictly upon the data in Table 2. However, the additional flexibility inherent in the superheater and steam headers would reduce the stresses to below 14,240 psi.

The task force report mentioned previously in this discussion suggests a different (and, in the opinion of the writer, a better) approach to the interpretation of flexibility calculations. The allowable stress values recommended by the task force are given by the formula

$$S_A = f(1.25\ S_c + 0.50\ S_h)$$

The factor f is intended to reduce allowable stresses in the case of cyclic operation. Presuming five cycles per week, and a life of 25 years, gives a total of 6500 cycles which is less than the top limit (7000) for the first category; hence, $f = 1.0$. Thus

$$S_A = 1.25 \times 12{,}000 + 0.50 \times 10{,}700 = 20{,}350 \text{ psi}$$

for grade A pipe. No longitudinal pressure stress need be subtracted from this value, but calculations are to be performed using the modulus of elasticity at room temperature, and no allowance is permitted for cold springing.

How Stop Leaky Joints?

The question that bothers Herman is not the stress in his pipe, but what can he do about his leaking joint. The leak occurs at point C (according to the writer's interpretation of the text) where the bending moment is greatest. In the "old" set-up, the moment was 188,800 in.-lb. (all the values cited here are based upon $E = 30{,}000{,}000$). In the present set-up, the value is 220,400 in.-lb, and in Mac's proposed set-up (not counting coldspring) the value is 199,100 in.-lb (Incidentally, we may note that Mac was unduly critical of the effect of Herman's 6 ft radius bend on the flexibility of the line; compare the results for Cases 2 and 3). The difference between 220,400 and 199,100 is not inconsiderable, but is it enough to stop the leak?

Of much more likely influence is the effect of judicious cold springing. Except for the influence of relaxation under temperature, use of 50 percent cold spring should reduce *actual* bending moments by one-half (even though the present ASA code does not permit counting more than a one-third reduction in *stresses*). Actually, because of the difference in modulus of elasticity at room and elevated temperatures, there is advantage in cold springing more than 50 percent. In the case under consideration, $15/28 = 0.535$ cold spring is advantageous under the calculation procedure given in the task force report. Here we would have

$M_H = [1 - (2/3 \times 15/28)] \times [25{,}000{,}000/30{,}000{,}000] \times [220{,}400] = 118{,}100$ in.-lb (Hot)

$M_C = (15/28)\ (220{,}400) = 118{,}100$ in.-lb (Cold)

which is a considerable reduction. Of course, the flanged joint itself can't read the code and understand the subtleties of the calculations involved. The point is that judicious cold spring alone will reduce the troublesome bending moment to a value considerably less than that which obtained (188,800 in.-lb) in the case of the old lead.

While it is quite possible that the use of alloy bolting, heavier series flanges, appropriate gasket material (such as a spiral wound metal and asbestos gasket), and good make-up practice (make the gate valve joint

TABLE 4 — ARE REQUIREMENTS of proposed ASA B31.1 code satisfied?

Case 1	No
Case 2	No
Case 3	No
Case 4	No
Case 5	No

TABLE 2 — REACTION FORCES, maximum bending moment and bending stress

(Figures in bold face were calculated using $E = 30{,}000{,}000$ psi; figures in light face were calculated using $E = 25{,}000{,}000$ psi; figures in parentheses, last column, are two-thirds of preceding figures.)

Case	Reaction forces (lb) Horizontal		Vertical		Maximum bending moment (in.-lb)		Maximum bending stress (psi)	
1	**1386**	1155	**359**	299	**188,800**	157,300	**22,260**	18,540 (12,360)
2	**1729**	1441	**390**	325	**220,300**	183,600	**25,970**	21,640 (14,430)
3	**1789**	1491	**418**	348	**220,400**	183,700	**25,980**	21,650 (14,430)
4	**1413**	1177	**263**	219	**199,100**	165,900	**23,470**	19,560 (13,040)
5	**1640**	1367	**358**	298	**212,900**	177,400	**25,090**	20,910 (13,940)

up completely using micrometers to measure bolt elongation, and then make up the other joints) could eliminate the difficulty, the most likely remedy is to cold spring the line. Changing the configuration to use an elbow rather than a bend does not seem warranted.

The question of whether or not the cold sprung line will be stressed within permissible code limits is still open. It appears to be O.K. under present code requirements and not O.K. under the proposed requirements. The writer does not intend to waste a "Yes" or "No" decision on a hypothetical case; the reader may conduct his own office poll.

Friction Loss

Finally, a remark concerning the friction loss through fittings. Inasmuch as applicable data is scattered and sometimes conflicting, such information as may be contained in the "resistance chart" which Mac refers to is of use in estimating total resistance in a line but of questionable validity in affording comparisons between alternate similar configurations.

Aside from the unusual arithmetic in the fifth paragraph of the section captioned "Now You're All Set" in the July article (the 9 in. bend actually provides exactly the same calculated resistance as does the 6 ft bend) the writer challenges the precision of the comparisons afforded. All that seems justified is to say that the overall resistance of the lead does not change appreciably for radii between 9 in. and 6 ft. A discussion of secondary flow in bends by a hydraulics expert would be of interest to the writer and certainly to other of HPAC's readers as well.

"It looked so simple," did it?

QUESTION OF THE MONTH

• *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*

• *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Removing Scale from Building's Piping

THIS IS IN REPLY to the recent question outlining the difficulties a reader is having with scaled hot water lines.

If the clogging reported is of sufficient importance to warrant spending the money involved, I would suggest that he call in one of the better known companies who do an acid cleaning job in such instances.

If, after the lines are acid-cleaned, he wants to guard against further troubles, this can be accomplished by the simple expedient of installing a zeolite water softener ahead of the hot water. It is my impression that the copper lines will be able to handle the more corrosive softened water without trouble.

The technical literature dealing with such problems is quite extensive. Such information is summarized in the ASHVE's Heating, Ventilating, Air Conditioning Guide, in the chapter on Corrosion and Water Formed Deposits, Causes and Prevention.—LEO F. COLLINS, Chemical Engineer, The Detroit Edison Co. Member of HPAC's board of consulting and contributing editors.

"Conventional" versus Packaged Boilers

ANENT THE RECENT Question of the Month, requesting a discussion of conventional versus package boilers, this is a highly controversial subject. It is easy to get widely divergent answers, depending on which side of the fence the answers are coming from.

The answers to this question published in the March HPAC hardly get into the meat of the subject. One gentleman confined himself to explaining why a conventional boiler takes up more space than a package type. But headroom was not even mentioned.

The three all important questions any prospective buyer wants to know about a boiler are: 1) Life expectancy; that is, how quickly it must be depreciated. 2) Performance, under various operating conditions, and the cost of the steam it produces with a given fuel. 3) Maintenance cost and ease of servicing during life of the equipment.

As to the first item, it has been said that package boilers have not been in use long enough to determine one way or the other. However, it is thought in some quarters that the conventional boiler should get the nod in this respect. On the other hand, the package boiler may offer features to offset the longer life consideration, such as lower overall first cost, ease of installation, lower space requirements (including headroom) and so on.

The second item, with its numerous ramifications, can be answered by those with long experience in owning and maintaining boilers. The question of fuel and firing is naturally a vital one with all boilers. Which fuel is best for the application in mind? The matter of fuels and firing also brings up questions like the comparative efficiency and life of rotary cup and steam atomizing burners, underfeed and overfeed stokers, design and construction of combustion chambers, fuel storage and handling, etc. Then there are the relative merits of fire tubes and water tubes, number of passes, the amount of heating surface, its efficiency, etc.

To continue, can the package boiler burner handle "heavy" No. 6 oil to advantage, will it produce dry steam, will it have good circulation, will its low water capacity have an adverse effect on its operation, and will it have a high draft loss?

And turning about — does the conventional type boiler have the high thermal efficiency, quick steaming ability and the low heating surface requirement of the package boiler?

The answers to the third item depend on many of the points just mentioned and also to such things as the accessibility of the boiler for easy and inexpensive cleaning and servicing.

These are the questions asked by prospective buyers and by engineers. If HPAC's readers would answer them for publication here, it would be a splendid service for everyone in the heating business.—F. A. R. (Design Engineer).

Are Protective Clauses in Franchises Effective?

PROTECTIVE CLAUSES in franchise agreements are common trade devices. These clauses seek, among other things, to restrict the manufacturer's liability for warranty of his product. The following case (the names are fictitious) explores one angle of the extent to which such restrictions are legally valid.

The defendant, Wahm-Coe, makes heating equipment. That company entered into a franchise agreement with the plaintiff, Konn Trakta, which stipulated among other things that the ". . . manufacturer shall repair or replace without charge any parts manufactured or supplied by it which may prove defective from poor material or workmanship within one year from date of installation", if the distributor (Konn Trakta) immediately forwards such alleged defective parts to the manufacturer, and that "the foregoing guarantee constitutes the only guarantee or warranty given or assumed by the manufacturer, and it is agreed that there are no implied warranties."

Wahm-Coe subsequently disseminated a circular in which it offered to the trade a boiler, No. PDQ7-11, with the statement that this equipment had a specified heating capacity. Konn Trakta purchased this boiler, relying upon the manufacturer's statement of its capacity. He believed that this reliance was according to general trade practice because the manufacturer of such an article possesses virtually exclusive knowledge of the quality and capacity of his product, while the buyer has little or no such knowledge.

Trakta installed the equipment in a job, where it transpired that the boiler did not have the heating capacity described. In consequence he suffered cancellation of his contract, whereupon he sued Wahm-Coe for damages, alleging "breach of express warranty."

Manufacturer's Defense

As a defense, the manufacturer contended that Konn Trakta should not be permitted to recover for breach of warranty because of the paragraph in his franchise which was quoted above. Furthermore, Wahm-Coe averred, the plaintiff Konn Trakta failed to show (a) that he resold the boiler under the warranty of capacity and also failed to show (b) that his loss resulting from the cancellation of his contract was the natural and probable result of the manufacturer's breach of warranty.

The court of common pleas entered a verdict judgment in favor of Konn Trakta, awarding him more than $3000 damages. Wahm-Coe appealed. The supreme court of the state handed down an affirming decision. The opinion was unanimous and couched in no uncertain terms.

The "qualified statement of capacity" made by the manufacturer was an express warranty, the higher court held, quoting a statute: "Any affirmation of fact or any promise by the seller relating to goods is an express warranty if the natural tendency of such affirmation or promise is to induce the buyer to purchase the goods." The supreme court sustained the finding that in this case the seller's statement respecting the boiler's capacity was an express warranty not borne out by the facts.

As for the manufacturer's protective clause in the franchise agreement, the trial court had dismissed his contention on the ground that if agreed to it would violate public policy. Though not giving this as the specific reason for deciding against Wahm-Coe, the higher tribunal could not refrain from pointing out that "if a manufacturer could escape all liability for future warranties by an agreement excluding them, it would oft-times be injurious if not disastrous to the business world and would open the door wide to fraudulent misrepresentations."

Must Construe Strictly

The supreme court threw out Wahm-Coe's contention because an exclusion provision must be strictly construed and the one in question related only to "prior or contemporaneous or present express warranties." It did not apply to future express warranties, which the manufacturer might make.

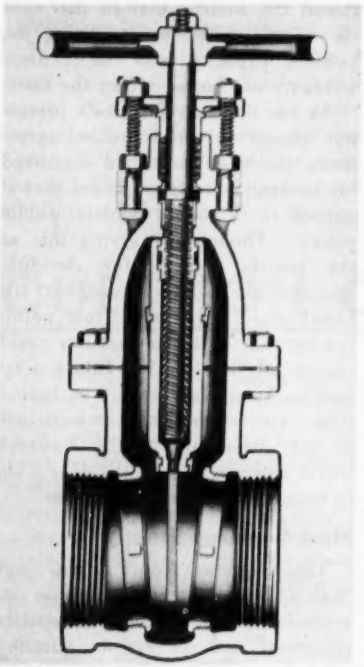
Respecting subsequent modifications of the protective clause, the higher court said that ". . . it is well settled that a written agreement may be modified by a subsequent (written or) oral agreement and that this modification may be shown by writings or by words or by conduct or by all three."

The supreme court was not impressed by what the plaintiff had allegedly failed to show. Where goods are sold with a warranty to a dealer it must be assumed, according to previous decisions, that the dealer may *resell them with similar warranty* to a subpurchaser. If this is done and the subpurchaser (Konn Trakta's client in this case) recovers damages from the buyer (Konn Trakta), the latter has a prima facie right to recover these damages from the seller who originally sold him the goods.

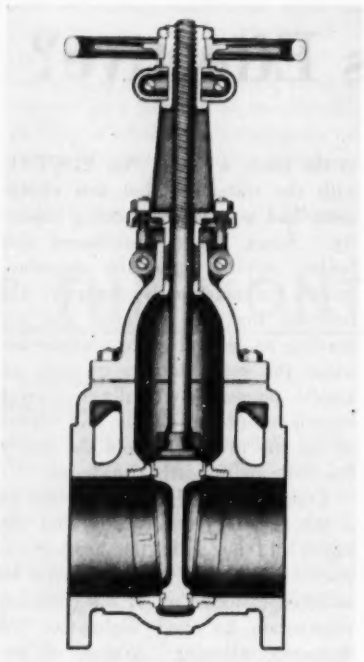
[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

William Hurd Hillyer, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

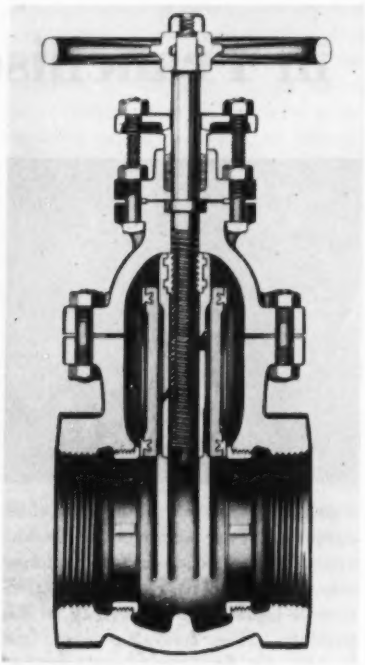
ANYTHING CAN HAPPEN



NON-RISING STEM iron body wedge gate valve (open)



OUTSIDE SCREW AND YOKE iron body wedge gate valve (closed)



NON-RISING STEM iron body double disc gate (open)

How Do You Know Valve Is Closed?

. . . . a lively discussion at the "Engineers Club"

By Bill Dopp

• *Almost anything can happen when you're in the engineering, operating, contracting or sales ends of the heating, piping and air conditioning industry. The objective of this more-or-less regular editorial feature in HPAC is to discuss practical problems that need solving — and ways to solve them.*

Bill Dopp has had 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting some of his present leisure to drawing on his many piping experiences, as he does in this story . . . .

"YOU SURE STARTED something, mister," Buck Hanson grinned at Martin MacVane, the gasket salesman.

"I did?" The innocent look on Mac's face belied the twinkle in his eyes.

"You did. I suppose you don't remember the little question you fired at me when you were here the last time about how do you know when a gate valve is closed?"

"So how does that get me in bad?," asked Mac. "It's a good question."

"You bet it's a good question," said Buck, "in fact so good that Andy Brown, president of the Engineers Club, is still sore at me." Buck began to chuckle. "At the last meeting Andy asked if anyone had any new business. I got up and said, 'I have been asked a question and wonder if anyone can tell me the answer?' Then I sprung it."

"What happened?" Mac was doing the grinning now. "Start a riot?"

"You Can't Tell"

"Pretty near," answered Buck. "Pete Mulhern — you know, the big fellow up at the light plant — was up on his feet in nothing flat. 'You can't,' he said, 'a gate valve was never meant to be tight. If you want to know you've got a tight valve you've got to use an angle or a globe.' He hardly got that out before four or five were on their feet all talking at once, while Andy pounded the gavel."

Mac leaned back and laughed. "Boy, I'd loved to have been there."

Buck continued, "Andy finally got some order and called on Pete. 'Now, Mr. Mulhern, you have made a flat statement that some of our members don't seem to agree with. Suppose you explain just what you mean.' So Pete gets up as if he were going to lick anyone who dared to disagree with him and says: 'I meant just what I said. Everybody that has to deal with valves knows that you can't depend on a gate valve being tight. They always have leaked and they probably always will. Now, with a globe valve, you shut it off and you know that it will be tight and stay that way; that is, if you haven't got it in backwards. But a gate — they've always had a bad reputation.' Andy quickly shut off a new argument. 'Don't let's get on the subject of how to install a globe valve,' he said. 'We've got enough on our hands right now. Mr. Anderson, we'll listen to you next.' You know Mac, I've seldom seen our gang as interested in a discussion as they were in this one."

Mac, too, showed a keen interest in the argument. Mulhern had voiced a very common belief among operating engineers. It would be fun to see who could knock down such an old and mistaken idea. "What kind of argument did Anderson put up, Buck?"

"Use a Persuader"

"You know how he uncoils when he gets up. He just took his time so that everyone was hanging on his first words. 'I think my good friend Pete is all wrong. In fact, I know that he is.' You should have seen Pete's face. 'We all used to think that way before we learned that you could not consider a gate valve closed because you were tired. Many a valve has been ruined because the operator gave up before it was really closed. Then, too, you have to remember that a valve that is closed while it is hot should be followed up when it gets cold. That goes for a gate as well as for a globe.' He looked the crowd over, and continued. 'If there's pressure on the valve you can't get a wedge gate closed really tight unless you use a persuader.' Bang — Andy's gavel was going again. Everybody wanted to get his two cents worth in and it took quite a few minutes to get order. Andy called on old man McPherson. He seldom says anything at meetings but he got up. 'It's faith you have to have,' he says. 'The man who makes the valve expects you to close it tight; but how you know when it gets that way I'm sure I don't know, now that I think about it.' The old boy sat down with a thump."

"The place was really getting hot, eh? Who got in the next oar?" the laughing Mac wanted to know.

"Andy called on that young fellow, Harrington, that's taken over the coke plant. He's got a big job. He said, 'Mr. President, I don't think there is any way that you can tell when a gate valve, or any other valve for that matter, is really closed, unless it is equipped with an accurate indicator. Since the Romans made the first valves I suppose that the matter of tightness has been bothering users of valves. It is a fact that valves today are about as reliable a product as you can buy. They will usually be tight without the use of undue force. When the load is heavy it may be necessary to use a persuader, as Mr. Anderson suggests. I have talked to many valve salesmen and the best they can tell you is that when the flow in the line stops the valve is closed tight. I'd like to hear what the gentleman who proposed this question has to say' . . . thereby putting me right on the spot."

"And, what did you say?" Mac really enjoyed the rueful look on Buck's face.

"What could I say?," Buck wanted to know. "I just told them I had been asked the question by a friend and that I would get an answer for them. Now, Mac, it's up to you to supply the answer."

"Harrington was right, Buck. There is no way of telling when a gate valve is really closed."

"What?," Buck said in astonishment. "Do you mean to tell me that in all these years manufacturers haven't found a way. There must be."

Four Types of Gate Valves

"No, Buck there isn't. Hand me that book." Mac pointed to a valve catalog. "Look here at these cross sections of gate valves. There are four types: rising and non-rising stems, and wedge and double disc gates. Let's take the non-rising stem double disc valve first. You see it here with the disc up, the valve open. Suppose there were a piece of wood on the bottom of the valve clear across the seat rings."

Mac stopped. The look of unbelief on Buck's face was comical. "Oh, yes. I've seen two by fours, lunch boxes, wrenches, hammers and even a dead cat taken out of pipe lines. So almost anything could be in the way."

Mac turned back to the book. "Turn the handwheel and the disc moves down. Yes? Until it strikes the obstruction. Then you stop. Now, unless you have counted the number of turns you haven't the slightest idea whether the valve is closed or not. In spite of the way Harrington messed up history his statement that only by the stopping of the flow in the line could you tell, was correct."

Buck's wrinkled brow showed that he was impressed. "Then I suppose if you use a persuader, according to Anderson's idea, you would probably injure the valve or break the stem," he commented.

"Right," replied Mac. "Unintelligent use of a persuader can do a lot of damage. And yet there is a legitimate use for them."

"Where?," promptly asked Buck.

"Hold that a minute," said Mac. "Let's suppose that there is nothing in the valve. Still, when you have turned the wheel as far as you can you continue to get a trickle of fluid in your line. Either you have a scored valve or the valve is not closed tight. Is there anything on the valve to tell you that the valve is closed?"

"Not a darn thing," answered Buck. "I'd put more beef into it and try to close it."

"Or the gentle use of a persuader might be just the thing. You have to watch out, though — rough stuff won't do." Mac was emphatic.

"Looking at this cut of a non-rising stem wedge gate you can see that the same thing would be true. The use of a persuader here is not so serious as you do not have to consider the jamming of the loose wedges. The wedge disc, however, may be binding quite a while before it gets to its seat. The effort to send the disc home can tire you out before you get it nearly there. In other words you may decide that the valve is closed because you are tired, as Anderson put it. The two things really have no relation to one another."

"Mac, you're making it harder all the time to get that valve closed." Buck was kidding.

"You're dead right. Don't you see where Mulhern gets his idea that you can't expect a gate valve to be tight?"

"You bet I see and I'm beginning to agree with him," Buck said.

"In a sense McPherson was right, too. You have to have faith in the valve and in the integrity of the firm that made it. Practically all the valves on the market today are good valves. Some better than others, perhaps, but you can pretty well rely on the product you get as far as material and workmanship are concerned. The way a valve is used is what counts. In spite of the reputation that gate valves have acquired at the hands of fellows like Mulhern, they can be closed tight and will stay that way."

"But, Mac, you said you might have to use a persuader. Why don't they put handwheels on the valves that are big enough to close them?" Buck seemed sure that he had a point.

Apply Reasonable Energy

"Buck, the wheels that are furnished with the valves will close them tight under ordinary circumstances. That is, if you apply a reasonable amount of energy to the job. Did it ever occur to you that there is seldom any trouble in the closing of a motor operated valve?"

"No, I'll admit I never gave it any thought. I'm sure I never heard of any such trouble."

"Think a moment of the difference in the way the power is applied when you use a motor. The disc starts to move and keeps on going in a steady, even travel until the predetermined load shuts off the power. That load was set at the factory to actually close the valve under maximum service conditions."

"That's more or less like a ram," observed Buck.

"In a way, yes. When you close the same valve by hand, you do it in jerks. Even these are uneven. As you get to the closed position and the work becomes harder, you slow up some more or stop for a while. Frankly, your power source is not very good. They put bypasses on valves to help equalize the load when you are opening them. That doesn't help you when you are closing them."

"Mac, just how complicated can so commonplace a thing as the closing of a valve be? When you were here last we had that distorted valve body. There, something entirely outside the valve itself affected the closing. Now you point out another thing that has even more effect — the way you apply the power to close it."

The O S & Y Gate

"True. Now let's consider the O S & Y gate in relation to our original question. Take a look at this wedge gate. The stem goes through the yoke sleeve. I suppose you will say that you can tell when the valve is closed by looking at the stem."

"Of course you can. When the stem is down the valve is closed." Buck was very sure of himself. "That should be simple to prove."

"Let me tell you a little story, Buck." Mac sized up his friend with a smile. "Some time ago I went into a plant. The chief was hot under the collar because a valve on the end of a steam line leaked quite badly. He was damning the valve and its maker — a brand new valve, too. He invited me to come take a look at it. We saw a 300 pound O S & Y gate on the end of a steam line carrying only 250 pounds on it. The lower edge of the disc showed a line of bubbles spewing steam all over the place. That valve sure was leaking." Mac could see Buck trying to anticipate the rest of the story.

"I asked who had closed the valve," continued Mac. "A husky steamfitter stepped up saying, 'I did,' packing a lot of pride into the answer. 'Get me a couple of twelve inch wrenches,' I said, avoiding the chief while he got them. I put one wrench on each side of the handwheel. 'Now close that valve,' I ordered. The fitter looked kind of funny but took hold and actually got a full turn out of that stem."

"You used the persuader," laughed Buck, "and just applied more beef." He seemed pleased at the solution, but he missed Mac's point.

"Sure," said Mac, "but that fellow thought the valve was closed because the stem was down."

"Oh!" Buck exclaimed.

"So you see that the stem does not tell the story. You can't tell how far down the stem should go because there is no mark that will tell you when to stop. I've known operators who put a saw cut across the stem and into the yoke sleeve, but that has certain bugs in it too."

"Then you really can't tell from the valve itself when a gate valve is closed," declared Buck.

"Yes. Harrington was right. There is no way to tell when your valve is closed. Both Anderson and McPherson were right, too. You do have to use a persuader at times. Anderson should have warned, however, that he did not mean a six foot length of pipe. These things must be used with extreme care and never on a globe or angle valve."

"So that leaves Mulhern out in the cold," laughed Buck.

"Not entirely," declared Mac. "Pete was right in this. You can't depend on a gate valve being closed tight just by looking at it. You have to know what you are doing."

"Looks as though I'd have to write a report on your question. Will you look it over before I turn it in? I'm not much good at that sort of thing." Buck's expression was doubtful.

"Sure, send it to me. Maybe I'll add a few words myself."

"Thanks a lot, Mac. By the way — you said Harrington had messed up his history. I've heard that you have made quite a study of the history of piping. Why not give us a little talk on that up at the Club some night? I'll bet you can make it interesting."

"Could be," reluctantly replied Mac. "I'll talk to Andy Brown about it some time. Give him my regards. Good luck with your report." And Mac was on his way.

DATA SHEET

Velocity-Pressure Chart for Air Flow

By Ben Briskin

Mechanical Engineer
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WHEN DESIGNING ventilation and air conditioning systems with rectangular ducts, it is often convenient to have a direct reference between air quantity, duct area, and velocity pressure or velocity. Friction losses may be determined as a percentage of velocity pressure, or it may be desired to know the velocity pressure in various duct sections so as to know the possible static pressure regain, or certain ducts may be sized for constant velocity. The velocity pressure chart published here enables a quick determination of velocity pressure, cross sectional duct area, or air quantity when any two are known.

To use the chart, let us assume as an example that duct size = 20 in. x 34 in. and air quantity = 6500 cfm. It is required to find velocity pressure and velocity.

The cross sectional duct area is 20 in. x 34 in. = 680 sq in.

Referring to the chart, the area of 680 sq in. is found on the bottom scale and followed upward to where it intersects with the air quantity of 6500 cfm. Following across the chart horizontally, the velocity pressure is found to be 0.12 in. WG and the corresponding velocity is 1400 fpm.

For a second case, assume duct size = 72 in. x 36 in. and desired maximum velocity = 1800 fpm. It is required to find the maximum air quantity.

The cross sectional duct area may be determined as 72 in. x 36 in. = 2592 sq. in. or as 6 ft x 3 ft = 18 sq ft.

Referring to the chart, the maximum air quantity the duct will take under these conditions is 33,000 cfm.

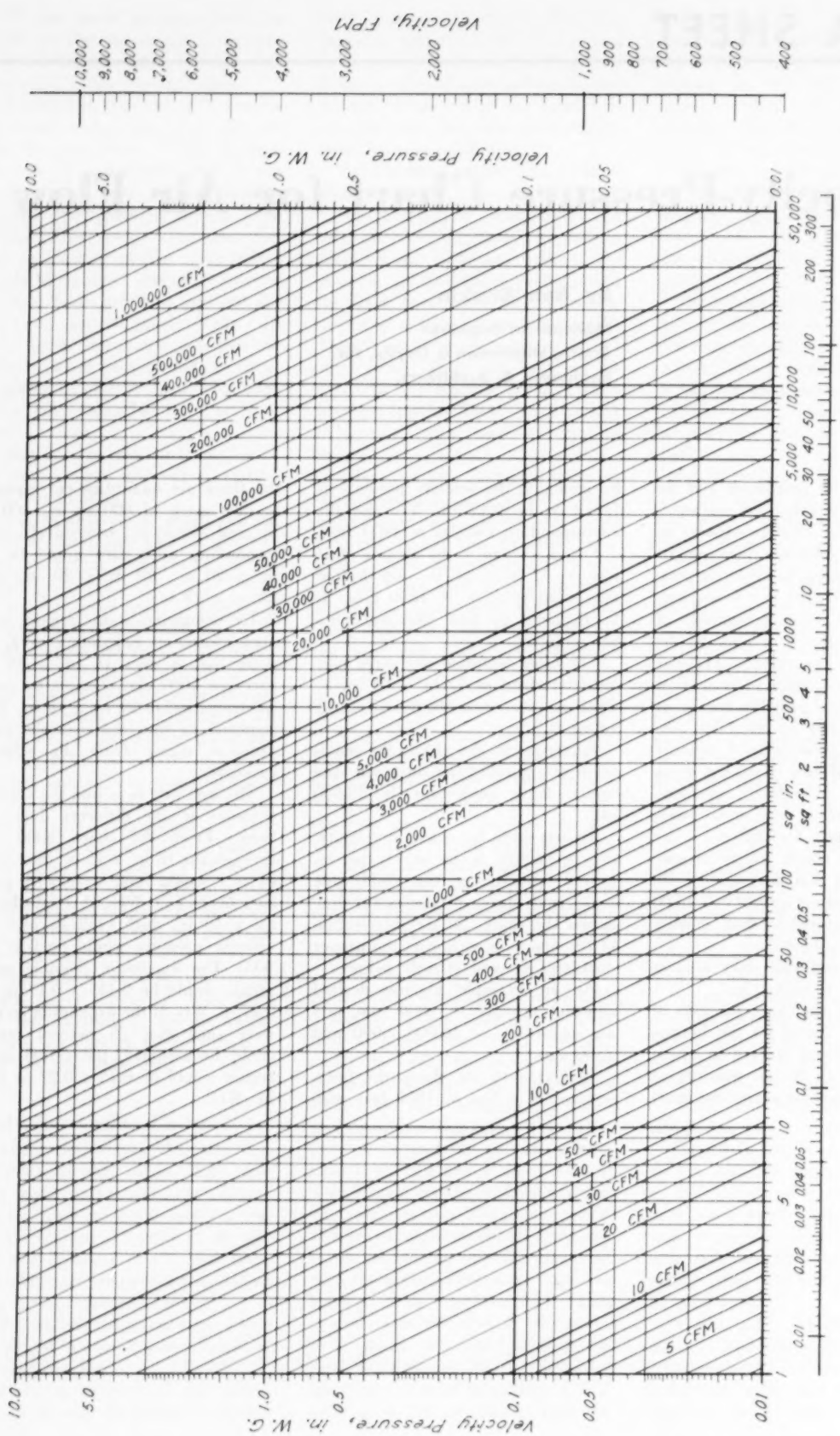
To size ducts for constant velocity, the procedure is to select the required velocity at the right side scale and draw a horizontal line across the chart. At the intersection of the line with each cfm, the proper duct area is read directly below.

As an example assume desired constant velocity = 1800 fpm, and air quantities = 10,000, 5000 and 3300 cfm.

Referring to the chart, the intersections of a line at 1800 fpm with the three air quantities corresponds to duct areas of 800 sq in., 400 sq in., and 260 sq in., respectively. Corresponding duct sizes might be 40 in. x 20 in., 20 in. x 20 in., and 22 in. x 12 in.

To determine static regain in a duct section of expanding area, assume that a duct 18 in. x 15 in. carrying 5000 cfm changes by gradual transition to 24 in. x 18 in. It is required to find the possible static pressure regain from the velocity pressure.

The first step is to find the velocity pressure in the different duct sections. From the chart, 5000 cfm through the 18 in. x 15 in. duct (270 sq in.) would have a velocity pressure of 0.44 in. WG. Through the 24 in. x 18 in. duct (432 sq in.) the velocity pressure would be 0.17 in. WG. The maximum possible static regain would be 0.44 — 0.17 in. or 0.27 in. WG. If the expanding section were such that 75 percent regain could be assumed, the actual static regain would be 0.75 x 0.27 or 0.20 in. WG.


Velocity, FPM
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
900
800
700
600
500
400
Velocity Pressure, in. W.G.
10.0
5.0
1.0
0.5
0.1
0.05
0.01
1,000,000 CFM
500,000 CFM
400,000 CFM
300,000 CFM
200,000 CFM
100,000 CFM
50,000 CFM
40,000 CFM
30,000 CFM
20,000 CFM
10,000 CFM
5,000 CFM
4,000 CFM
3,000 CFM
2,000 CFM
1,000 CFM
500 CFM
400 CFM
300 CFM
200 CFM
100 CFM
50 CFM
40 CFM
30 CFM
20 CFM
10 CFM
5 CFM
Duct Area
1 sq in.
1 sq ft
50,000
30,000
20,000
10,000
5,000
4,000
3,000
2,000
1,000
500
400
300
200
100
50
40
30
20
10
5
1
Velocity Pressure Chart
For 70°F Std Air VP=(V/4005)²

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

Effect of Relative Humidity on Heat Loss of Men Exposed to Environments of 80, 76, and 72 F

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This paper is the result of research sponsored by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and by the United States Public Health Service in cooperation with the University of Illinois, College of Medicine, Chicago, Ill.

SUMMARY—Five *fasting* men either nude or dressed in union suits were studied in environments maintained at 76 F with either a 30 or 80 percent RH. These men slept overnight in the environment in which they were observed the following morning. Observations on skin and rectal temperatures, body weights and heat production were made.

Subsequently, 10 young healthy men were studied over a period of three hours in each of three environments having a temperature of either 80, 76 or 72 F and a relative humidity of either 30 or 80 percent. Eight women were studied in environments maintained at 80, 76 or 72 F with a 30 percent RH. Observations on skin and rectal temperatures, body weights and thermal sensations were made after the subjects were dressed in the union suits. These subjects were non-fasting.

THE PURPOSE of this investigation has been to reexamine the effects of environments with widely different relative humidities on the partition of heat loss of uniformly and lightly clad men and on their subjective sensations of thermal comfort. The environments were selected to slowly cool the skin without inducing visible sweat or apparent shivering during a period of three hours. From a review of results obtained by previous investigators, it is evident that the results were not consistent with those which are obtained by summation of the effect of relative humidity on the nude and of clothing on the nude. A discussion of the tests of previous investigators follows.

The influence of relative humidity on the partition of heat loss of subjects exposed to comfortable environments has been of interest to many observers concerned with heat balance and with thermal comfort. Benedict and Root,[1] in an effort to devise a simple method for predicting total heat production, found that heat loss by evaporation of *insensible* sweat varied directly with heat production. This was presented in a graph, an analysis of which showed that for every 2¼ Btu per hr of heat produced in excess of 78 Btu per hr there was 1 Btu per hr of heat lost by evaporation. The ideal conditions recommended for this production of heat were to stabilize the patient just below the sweating level, by exposure to an environment maintained at 73.4 F or by adjusting the amount of

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[1]Exponent numerals refer to References.

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clothing or bed covering. Wiley and Newburgh[2] demonstrated that relative humidity of the environment influenced the rate of heat loss by evaporation in the nude man. An environment maintained at 82.4 F with a 20 percent RH (relative humidity) in contrast to one with an 80 percent RH induced significantly greater heat loss by evaporation, although the heat production and skin temperature remained the same. This effect of relative humidity on the water losses was also shown with small areas of the body by Vasti,[3] who used intact skin, and by Pinson,[4] who used skin having the sweat glands inactivated. The results on the nude, however, were not substantiated by Winslow and others[5] with their studies by partitional calorimetry. The discrepancies in the results are perhaps explained by differences in procedure. Wiley and Newburgh[2] observed their subject for 150 min thus allowing more time than the other investigators for stabilization and adjustment to the environment.

It was apparent to Freeman and Lengyel[6] that the effects of relative humidity on evaporation demonstrated by Wiley and Newburgh must be reflected in skin temperatures if heat balance was to be maintained. After their nude fasting men remained for about 30 min in a comfortable environment maintained at 75.2 F with a 20 percent RH, the relative humidity was increased to 90 percent causing the rate of progressive cooling of the skin to be significantly slowed. These results confirmed those of Miura[7] and Phelps and Vold[8] who showed that atmospheres with high relative humidities in contrast to low relative humidities induced higher levels of skin temperature on the face. The effects of relative humidity on skin temperature were, on the other hand, not observed by others.[5]

The addition of light clothing to the nude has been shown to raise the levels of skin temperatures without appreciably increasing heat loss by evaporation,[2] heat production, or storage.[9] The effects of relative humidity on men dressed in selected street clothes were studied by Houghten and others[10] to determine the environmental factors concerned with heat production and heat loss in order to supply ventilation more conducive to health and comfort. He studied a group of seven healthy young men during a period of four hours in comfortable environments with either 20, 45, 70 or 95 percent RH. These studies showed that heat losses by evaporation, radiation and convection were not affected by the relative humidity. Heat loss by radiation and convection combined was determined by difference between total heat production and heat loss by evaporation. These results on heat losses were duplicated by Wiley and Newburgh[2] who showed, in determining the percentage of heat loss by evaporation to total heat production, that the addition of light clothing abolished the effects of relative humidity observed in their nude subject. Their fasting man was dressed in pajamas and was exposed to either 20 or 60 percent RH in environments maintained as low as 77 F. Similar conclusions were reported by others.[11,12,13,14]

Table 1—The Physical Measurements of Subjects

Subject	Age years	Height inches	Weight pounds	Surface Area sq ft
Men (fasting)				
V.V.	23	67	155	19.5
L.T.	17	70	137	19.0
A.K.	20	70	125	19.0
A.R.	20	69	197	21.7
B.K.	23	68	141	19.4
Men (non-fasting)				
M.B.	22	67	146	19.1
W.F.	22	68	148	19.4
W.G.	26	72	139	19.6
J.G.	24	71	135	19.2
N.G.	21	65	125	17.4
N.L.	26	66	162	19.8
A.M.	20	66	133	18.2
L.P.	24	72	199	22.8
C.R.	22	73	195	22.8
N.S.	19	69	188	21.6
Women (non-fasting)				
C.C.	19	63	124	16.9
J.D.	24	64	112	15.8
C.H.	21	63	107	16.0
G.K.	24	66	116	16.9
M.L.	19	64	135	17.9
L.M.	20	66	150	19.2
D.M.	21	66	140	18.4
D.N.	20	62	105	15.5
AVERAGE				
Men (fasting)	20.6	68.8	151.0	19.7
Men (non-fasting)	23.6	68.9	157.0	20.0
Women (non-fasting)	21.0	64.3	123.6	17.1

Earlier reports from this laboratory[15] indicated that an environment maintained at 76 F with an 80 percent RH produced significantly higher levels of skin temperatures than one at 76 F with a 30 percent RH, without affecting heat loss by evaporation. The subjects were lightly clad and non-fasting and were exposed for an hour. A subsequent report[16] using identical experimental conditions failed to confirm these results. It was believed that the discrepancies in the studies were due to the varying degrees of vaso-motor stability and irritability of the subjects as shown by the differences in the levels of rectal temperatures at the time of the exposures. The lack of effect of relative humidity on the skin temperatures of the lightly clothed subjects has also been shown by others.[11]

Test Procedure

This study was carried out in two series of experiments. In the first series the experiments were conducted on five, *fasting*, young healthy men (described in Table 1) during the fall. These men slept overnight in a psychrometric room maintained at a uniform temperature of 76 F with either a 30 or 80 percent RH and with an air velocity of less than 20 fpm. The men selected their bed clothing as desired. About 30 min after awakening these men were seated on a balance and weighed at intervals of 30 min for 90 min either in the nude fitted with multiple thermocouples or clothed in union suits rigged with thermocouples.[15] Heat production (basal metabolism) was determined on the men while in bed and while sitting on the balance at the beginning and end of the observation period. Rectal and skin temperatures were also recorded every 30 min.

In the second series, the experiments were conducted on *non-fasting*, young, healthy males. The men were studied during the winter and spring and the women studied during the summer. Ten men (described in Table 1) were studied in the follow-

Table 2—Comparison of Observations on Mean Skin and Rectal Temperatures, Heat Loss by Evaporation and Heat Production between Nude and Clothed, Fasting Men Exposed to Environments Maintained at 76 F with either a 30 or 80 Percent RH

Observations	Physiological Adjustments			
	Nude		Clothed	
	30 Percent RH	80 Percent RH	30 Percent RH	80 Percent RH
Mean Skin Temperature F	90.16	90.42	90.79[a]	91.19
Rectal Temperature F	98.02	97.94	97.86	97.74
Heat Loss by Evaporation				
Btu per (hr) (sq ft)	4.5	3.2[b]	4.7	3.6[b]
Heat Production				
Btu per (hr) (sq ft)				
Beginning of test	13.4	13.3	13.6	13.3
End of test	13.2	13.0	12.8	13.4

[a]Effects of the addition of clothing are statistically significant.
[b]Effects of relative humidity are statistically significant.

ing manner. The subjects reported to the staff office after breakfast or lunch and sat quietly for 30 min. They then entered the psychrometric room, removed their clothing, dressed in the union suits rigged with thermocouples[15] and sat on the balance for the remainder of the experiment. The psychrometric room was maintained at either 80, 76 or 72 F with either a 30 or 80 percent RH and with an air velocity of less than 20 fpm. They stayed in each environment for 3 hr, 30 min of which was required to weigh and dress the nude subjects. Eight women (described in Table 1) wearing union suits were studied in the same manner. These subjects were exposed to environments maintained at either 80, 76 or 72 F with a 30 percent RH.

The procedure permitted observations of skin and rectal temperatures, body weights and thermal sensations. Heat loss by evaporation was calculated from changes in body weight assuming minimal errors attributed to respiratory gaseous exchange.

In the first series, the subjects were at basal conditions and their skin temperatures were well adjusted to the environment at the start of the experiment. In the second series, the heat production was approximately 20 to 30 percent above the basal level as the result of their previous activity and the specific dynamic effects of the meal eaten shortly before entrance. On removal of street clothing in no instance was sweating observed on entrance. The subjects reported no discomfort. From an inspection of the curves of skin temperature it would appear that the adjustments to change from street clothing to union suits were completed in approximately 15 min after observations were begun.

Results on Men

Mean skin temperature

The data on the *fasting* men (first series) obtained about 2 hr after awakening are averaged in Table 2. Heat production is the same in the nude and clothed subjects regardless of the relative humidity of the environment. The heat production taken with the subjects still in bed immediately upon awakening was the same as that taken at the beginning of the observations. It is also the same at the beginning and end of the observation period for each experiment. The mean skin temperatures of similarly clothed subjects were the same in environments with either 30 or 80 percent RH. The mean skin temperatures were higher in the clothed than in the nude only in the environment with the 30 percent RH.

The data obtained on the clothed, *non-fasting* men observed in environments maintained at 80, 76 and 72 F with either a 30 or 80 percent RH are illustrated in Figs. 1, 2 and 3 and are compared in Table 3. The mean skin temperatures were higher in environments maintained at the higher temperature with the same relative humidities. In each environment there were progressive falls in the mean skin temperatures, the greater decreases occurring at the lower environmental temperatures. It is apparent in Figs. 1, 2 and 3 that the skin temperatures dropped faster in an environment with a 30 percent than with an 80 percent RH. A statistically significant difference between the mean skin temperatures appeared in 80 min when the environmental temperature was 80 F, Fig. 1. The difference appeared in 140 min when the men were exposed to an environment of 76 F, Fig. 2, and in 180 min to an environment of 72 F, Fig. 3. The time of appearance of a significant difference in the mean skin temperatures attributable to relative humidity is indicated in each figure by a double arrow.

Rectal temperature

The rectal temperatures of the men were statistically unaffected by either 30 or 80 percent RH or clothing as shown in Figs. 1, 2 and 3 and Table 2. The greatest decline in rectal

Table 3—Mean Skin Temperatures of Non-Fasting Men Dressed in Union Suits Exposed to Environments Maintained at 80, 76 or 72 F with either a 30 or 80 Percent RH. The Values for the men and women are compared when exposed to environments with 30 Percent RH.

Environment			Mean Skin Temperature F				
Temperature F	Percent RH	Effective Temperature	60	90	120	150	180
MEN							
72	30	66.2	90.63[b]	90.06	89.44	88.99	88.58
	80	70.5	90.69	90.25	89.74	89.44	89.14[a]
76	30	68.8	91.86[b]	91.65	91.33[b]	90.94	90.71
	80	77.5	92.06	92.12	91.96	91.79[a]	91.59[a]
80	30	71.8	92.89	92.75	92.69	92.46	92.36
	80	73.4	93.18	93.15[a]	93.11[a]	92.99[a]	92.89[a]
WOMEN							
72	30	66.2	89.72	89.25	88.68	88.32	87.98
76	30	68.8	91.17	90.61	90.32	90.08	89.97
80	30	71.8	92.53	92.43	92.28	92.20	92.13

[a]The mean skin temperature of the men is significantly higher in environments with an 80 rather than one with a 30 percent RH for comparable periods of exposure.

[b]The mean skin temperature of the men is significantly higher than those of the women, also dressed in union suits, for comparable periods of exposure in similar environment.

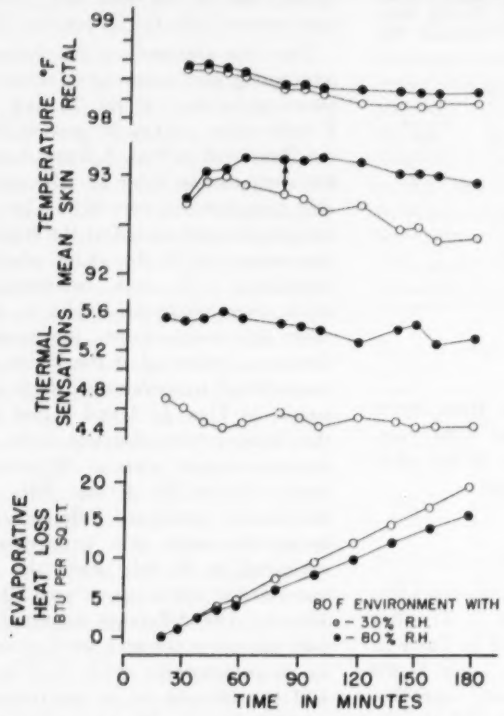

Fig. 1—The responses of mean skin and rectal temperatures, thermal sensations and heat loss by evaporation of men dressed in union suits exposed for three hours to an environment maintained at 80 F with either a 30 or 80 percent RH

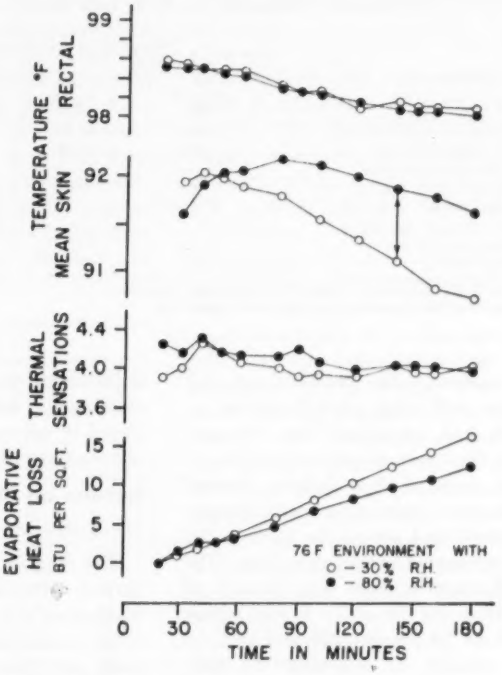

Fig. 2—The responses of mean skin and rectal temperatures, thermal sensations and heat loss by evaporation of men dressed in union suits exposed for three hours to an environment maintained at 76 F with either a 30 or 80 percent RH

temperature was observed in the environment maintained at 72 F, Fig. 3.

Heat loss by evaporation

The rates of heat loss by evaporation of similarly clothed, *fasting* men were greater in environments with a 30 percent rather than in those with an 80 percent RH, Table 2. The rate of heat loss by evaporation was not significantly greater with the addition of clothing when the subjects were exposed to similar environments. This rate might have become significantly greater had more clothed subjects been studied for a longer period of time.

The heat losses by evaporation of clothed, *non-fasting* men are plotted as a function of time in Figs. 1, 2 and 3. At each environmental temperature, the curves for the low and high relative humidities separated. The greater rates of heat loss by evaporation in an environment with the 30 in contrast to the 80 percent RH were manifested in the second hour when the environmental temperature was at 80 or 76 F and in the third hour when at 72 F. The rates during the third hour of exposure to each environment are compared in Table 4. It was also found that the rate of heat loss by evaporation was greater after three hours of exposure in environments maintained at higher temperatures with the same relative humidities.

Table 4—Heat Loss by Evaporation of Non-Fasting Men Dressed in Union Suits at the end of the Third Hour of Exposure to Environments Maintained at 80, 76 or 72 F with either a 30 or 80 Percent RH. The Heat Losses by Evaporation for the Women are Compared.

Environment		Heat Loss by Evaporation Btu per (hr) (sq ft)	
Temperature F	Percent RH	Men	Women
72	30	4.7[bc]	3.7[c]
	80	4.0[ac]	
76	30	6.2[bd]	4.4
	80	4.3[a]	
80	30	6.6[b]	4.8
	80	5.5[a]	

[a]Heat loss by evaporation is significantly greater in environments with a 30 percent than with an 80 percent RH.
[b]Heat loss by evaporation is significantly greater for the men than the women exposed to similar environments.
[c]Heat loss by evaporation is significantly greater in the environments maintained at 80 than at 72 F.
[d]Heat loss by evaporation is significantly greater in the non-fasting than the fasting subjects. The heat loss by evaporation in the fasting subjects who were clothed in union suits was 4.7 Btu per (hr) (sq ft).

Thermal sensation

Immediately upon entrance into the psychrometric room from the staff office, the men still dressed in their street clothes always felt the environment with an 80 percent to be warmer than the one with a 30 percent RH. In an environment maintained at 80 F, the difference in sensations persisted throughout the exposure. After a few minutes in environments maintained at 76 or 72 F these subjects felt thermally comfortable regardless of the relative humidity during the exposure of three hours. Thermal comfort included a range of thermal sensations from *very slightly cool* through *very slightly warm.*

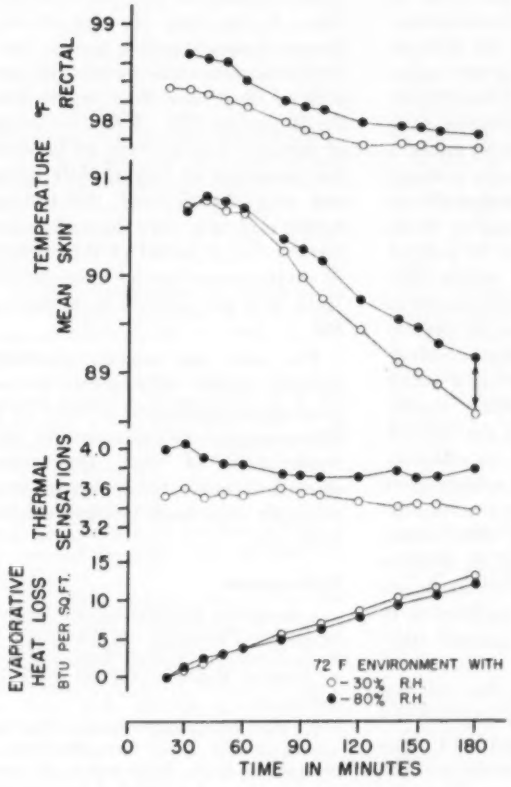

Fig. 3—The responses of mean skin and rectal temperatures, thermal sensations and heat loss by evaporation of men dressed in union suits exposed for three hours to an environment maintained at 72 F with either a 30 or 80 percent RH

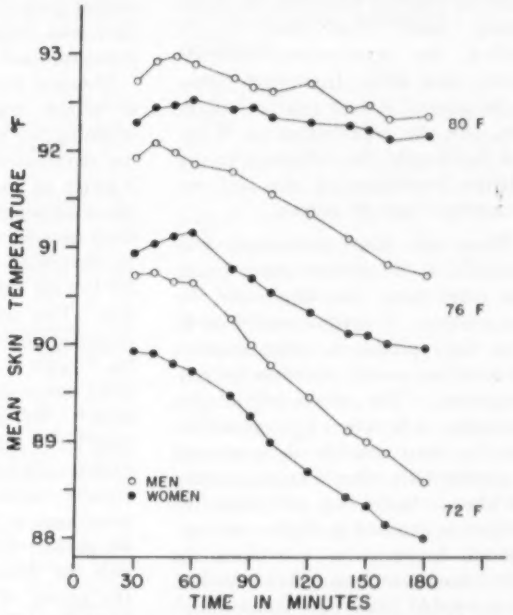

Fig. 4—The comparison of mean skin temperatures of men and women dressed in union suits exposed for three hours to environments maintained at either 80, 76 or 72 F with a 30 percent RH

Results on Women

The data from women in regard to mean skin temperatures and heat loss by evaporation are compared with those of the men in Tables 3 and 4, respectively.

The mean skin temperatures for both sexes are graphed as a function of time (see Fig. 4). It is evident that the mean skin temperatures of women exposed to environments maintained at 76 and 72 F started at lower levels but approached those of the men by the end of the third hour, as shown in Fig. 4 and Table 3. The rates of heat loss by evaporation were less for the women than for the men exposed to similar environments, Table 4. The thermal sensations were the same for the two sexes when exposed to similar environments. The rectal temperatures were also the same except in the environment maintained at 72 F in which the women showed significantly higher values than the men after the first hour of exposure. In this environment the levels were 98.5 and 97.9 F for the women and men, respectively, by the end of the third hour.

Discussion

The test data on the nude fasting men demonstrated that relative humidity affects heat loss by evaporation at a lower environmental temperature (76 F) than those studied by Wiley and Newburgh.[2] The addition of clothing elevated the skin temperatures of these subjects without altering heat production, storage, or heat loss by evaporation. Gagge and others[9] made similar observations. The elevated skin temperatures were necessary to overcome the thermal resistivity of the clothing since the same amount of heat was lost by radiation and convection as in the nude. Clothing reduces the temperature gradients in the skin much in the same manner as elevation of environmental temperatures shown by Bazett and McGlone.[17] The elevated skin temperatures are accompanied by vaso-dilation and an enlargement of the peripheral pool of water available for diffusion. This availability of water for diffusion is confirmed by the greater heat loss by evaporation at higher environmental temperatures even without free sweating. Burch and Winsor[18] and Pinson[4] have shown that the rate of diffusion of water through the skin was greater with higher tissue temperatures. The escape of water vapor from the surface of the skin into the ambient environment is then complicated by the barrier imposed by clothing. The authors' test results indicate that any resistance of the clothing to the escape of the water vapor is physiologically compensated by increased water vapor pressure at the surface of the skin. This increase in the vapor pressure is just sufficient to maintain the rate of heat loss observed in the nude. In order to demonstrate any

effect of relative humidity on these fasting men, who were lightly clothed, the experimental environments must differ from each other by 50 percent in their relative humidities. In the experiments of Wiley and Newburgh[2] the difference in the relative humidities of the test environments was 40 percent.

When the heat production was about 25 to 30 percent above basal, the extra heat was eliminated by evaporation. If greater quantities of heat were produced, other avenues of heat loss would doubtless be requisitioned. The effects of relative humidity on heat loss by evaporation can be more readily demonstrated experimentally when a large quantity of heat is to be lost and when the subject is exposed to higher environmental temperature, providing the latter does not cause active sweating. It was noted in the data that a significant difference in heat loss by evaporation attributable to relative humidity of the environment was shown in the second hour in environments of 80 and 76 F and in the third hour in one of 72 F. With the same heat production in all the conditions, greater heat loss by evaporation was demonstrated at higher environmental temperatures and their accompanying larger pools of available water in the skin. The reductions in heat loss by evaporation with the elevated relative humidities were accompanied by less cooling of the skin. The effects on the skin temperatures appeared in 80 min in an environment of 80 F, in 140 min in one of 76 F and in 180 min in one of 72 F. The differences in our results with those of Houghten and others[10] are to be explained by the types and amount of clothing. Houghten used a summer clothing assembly consisting of a two-piece cotton underwear, cotton shirt, a two-piece wool suit, socks and shoes; whereas, our subjects wore a single layer, cotton-wool, full length union suit. The lack of effects reported by others[11,12,13,14,16] is explained by differences in either clothing, environmental conditions, physiological state of the subjects, or experimental procedure. Attention is again called to the length of the authors' experimental period which was three hr. This was longer than the time of exposure used by other investigators.

Thermal sensations in the absence of either rapid cooling or rapid warming are essentially a function of the environmental temperature over a range of 76 to 72 F, with either a 30 or 80 percent RH. In the authors' tests men felt equally comfortable in an environment maintained at 76 or 72 F with either a 30 or 80 percent RH. This supplements earlier findings that environments maintained at 76 F with a 30, 60, or 80 percent RH were also thermally comfortable.[15] By changing from a union suit into summer clothing similar to that used by Houghten the men felt equally comfortable in an environment kept at 76 F with either 30 or 80 percent RH.[19] These results suggest the desirability of determining the extent of variations in relative humidity which may occur in an environment and yet go undetected in thermal sensation and general comfort.

In the present tests data on the women were obtained to establish the patterns of skin cooling and rates of heat loss by evaporation. The women appear to behave differently from the men when they are exposed to environments which allow their body to cool slowly. When contrasted with men in environments of 72 F the heat loss by evaporation was lower, the skin temperatures were the same but the rectal temperatures were higher. It is well known that the heat production is lower in the women than in men.[20] The differences observed could very plausibly be explained by the higher body fat in women[21] which furnishes some insulation.

Conclusions

Non-fasting men, lightly clad in union suits, showed greater heat loss by evaporation in environments maintained at 80, 76, or 72 F with a 30 percent than with an 80 percent RH. The effects attributed to relative humidity appeared more readily at the higher environmental temperatures.

These men reported that the environments maintained at 76 or 72 F with a 30 percent RH felt thermally the same as one with an 80 percent RH. At the time of entrance into the environment having similar temperatures, they felt warmer in one with an 80 percent than in one with the 30 percent RH. When the limits of thermal comfort were set between the sensations of *very slightly warm* and *very slightly cool*, the resting, lightly clad men were thermally comfortable for a period of three hours in environments having temperatures 76 to 72 F and with 30 to 80 percent RH.

The men and women generally showed similar adjustments to environments maintained at 80 or 76 F. When exposed to environments with temperatures of 72 F, the women showed adjustments which were most plausibly explained by their higher body fat.

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DISCUSSION

L. P. Herrington, New Haven, Conn. (Written): This is an excellent study of a problem complicated by considerable physiological variability when the subject is nude. When subjects are either clothed or nude, the effects of the hygroscopic properties of skin or clothing, related both to regain properties and to questions of moisture equilibrium present many difficulties.

In the work of the Pierce group, we have recognized that modifications of humidity with constant dry bulb are associated with changes in insensible rate for a transition period, the length of which is a complicated function of the subject's activity and exposure prior to the experiment, the absolute level of temperature, the air velocity, and the weight and fiber character of any clothing worn. After complete adaptation to a comfortable environment, we have found only minimal changes in insensible loss for large shifts in humidity at dry bulb in the region of insensible loss.

We regard the question in all such experiments as being that of providing data for an eventual multiple factor prediction of skin temperature and vapor loss rather than one of answering the titular question categorically for the innumerable ambient and subject conditions which are possible, although in the present instance such an interpretation is of practical interest.

The experiments reported here provide valuable data for the quantitative derivation of such an equation from the combined work of many experimenters. This end would be facilitated by publishing in the Journal Section, a description of the weight and fiber character of the suits worn, their regain behavior when heated internally to 90 F in the test environment, and a chart giving the time course of the subject's weight loss. Black body temperatures and air velocity data should be included if possible. Apart from obvious civil value, military interests in the equational features of this type of adjustment are considerable, and careful studies of this type can be added to current analyses if the accessory data mentioned can be made available in the Journal.

63 NEW STANDARDS APPROVED AT 1953 *ASTM* ANNUAL MEETING

The 1953 Annual Meeting of the *American Society for Testing Materials* held June 28-July 3 at Atlantic City featured 34 technical sessions at which were presented 131 technical papers covering various aspects of engineering materials. There was a near record attendance of 2472 at the 565 technical committees and their subcommittees.

Seventy-two of the Society's technical committees reported at the meeting, with the result that 63 new specifications and tests were approved and revisions in 185 existing tentatives and standards were acted on. A total of 62 specifications and tests that have been published previously as tentative were approved for reference to Society letter ballot for adoption as standard. All of these new and revised standards will be published in the year in the 1953 Supplement to the *Book of ASTM Standards*.

Including the 1953 Annual Meeting actions there are now about 1965 *ASTM* Standards. This compares with the figure 20 years ago of 690 and 10 years ago, 1943, of about 1200. These figures indicate a definitely increased tempo in standardization activities during the last decade.

Of the 34 technical sessions at the *ASTM* Annual Meeting, 16 comprised seven symposiums on timely material subjects. The symposiums covered metallic materials at low temperatures, fluorescent X-ray spectrographic analysis, radioactivity in *ASTM* work, electron metallography, lateral pile load tests, porcelain enamels and ceramic coatings as engineering materials, dynamic testing of soils. It is expected that the symposiums will be issued as special technical publications later in the year. Other groups of papers dealt with such subjects as steel; fatigue; concrete; atmospheric sampling, water, and simulated testing; plastics; and corrosion.

ASRE Holds Semi-Annual Meeting at Lake Placid

THE FORTIETH Semi-Annual Meeting of the *American Society of Refrigerating Engineers*, held at Lake Placid, N. Y., June 28-July 1, 1953, was attended by over 700 members, guests and their families. The meeting was held at the Lake Placid Club located in the Adirondack Mountains of upper New York State, and was accompanied by excellent weather.

There were three technical sessions and two conferences held at the meeting. The first technical session was called to order by the president, R. C. Jordan, in the Agora theater of the Lake Placid Club on Monday, June 29, and a cordial welcome to the meeting and the Lake Placid Club was extended by R. A. Baker of the Central New York Section, chairman of the convention committee.

President Jordan presided at the first session where several interesting papers were presented. These included: Cooling Tower Selection Chart and Its Application to Field Tests of Cooling Towers, by A. M. Norris, Baltimore, Md.; Air Cooling Coil Performance, by D. D. Wile, Los Angeles, Calif.; Year-Round Reflective Radiant Conditioning, by Dr. C. A. Mills, Cincinnati, Ohio; Technical Considerations Affecting Air Force Air Conditioning Requirements, by W. T. Smith, Washington, D. C.

Simultaneously with the first technical session a Domestic Refrigerator Engineering Conference was held in the Forest Tea Room with R. W. Ayres presiding. At this conference various aspects of the home freezer problem were discussed. L. M. S. Cooper of Amana, Ia. discussed the merits of upright *vs.* chest type home freezers while G. J. Fleck, Duluth, Minn. talked on design and operating characteristics of the upright household freezer. R. E. Cappel, Cincinnati, Ohio, spoke on the use of steel tube freezer evaporator coils. Other aspects of the problem covered included vapor barriers in chest type freezers, prevention of exterior sweating on freezer cabinets, consumer's influence on design, some unique features in home freezer design, the choice of a freezer liner, freezer insulation, and interior and shelf finishes for freezers.

The second technical session held in the Agora theater, at which Vice Pres. A. J. Hess presided, presented four technical papers. These were: A Discussion of Compressor Design — Including Some Unique Types, by A. A. McCormack, Cleveland, Ohio; The Effects of Internal Roughness on the Pressure Drop and Heat Transfer Characteristics of Integral Finned Tubes, by V. R. S. Arni and J. E. Myers, Purdue University, W. Lafayette, Ind., Heat Transfer Film Coefficients for Refrigerants Boiling Inside Tubes, by Merl Baker, University of Kentucky, Lexington, Ky.; Design Differences in Refrigerating Systems Due to Different Thermodynamic Properties of Two Refrigerants, by Leon Buehler, Jr., Chicago, Ill.

At the same time that the second technical session was held a Packaged Air Conditioner Conference was going on in the Forest Tea Room, Justin Neuhoff, presiding. E. Spiegel, Washington, D. C. pointed out the various aspects of the home air conditioning problem of importance to builders. These included operating costs, the necessity for water conservation, and the importance of keeping the initial cost and installation charges at a minimum.

R. M. Thompson, Cleveland, Ohio, chose as his topic, Design Consideration in Combining Summer and Winter Residential Air Conditioners. Mr. Thompson stated that the performance of summer systems is particularly important and it is necessary to keep the noise level of both the fan and compressor at low level. In designing systems the tonnage should be kept at a minimum if residential air conditioning is to realize its full potential.

The installation of packaged air conditioning equipment in modernizing existing homes was the subject of W. B. Cooper, Pittsburgh, Pa.

F. Y. Carter, Detroit, Mich., spoke on Residential Air Conditioner Control Systems and described several typical systems and how they can be used to overcome various heating and cooling problems.

The water conservation problem which was mentioned by several of the other speakers was the subject of the remarks of R. E. Holmes, Holyoke, Mass. Mr. Holmes listed the advantages and disadvantages of various types of residential air conditioning units from the viewpoint of water conservation. These included the air cooled, water cooled, and evaporative type systems and use of cooling towers as a water conservation means. In connection with cooling towers, he emphasized the problem of having the tower blend with the surroundings of the home.

J. D. Loveley, Dayton, Ohio, presented a talk prepared by Paul Wyckoff on a water saving device. The system described by Mr. Loveley was a sealed unit which employed six gallons of distilled water as the cooling medium. He pointed out a number of advantages of this unit which included the elimination of water consumption, simple installation, reduction of service costs, quietness of operation and attractive appearance.

The final talk of the Packaged Air Conditioner Conference was a description of the heat pump based on a year's operating experience by D. W. Lynch, Bloomfield, N. J. Mr. Lynch listed some of the problems which have been encountered in the installation and operation of a packaged air-to-air heat pump. Because of the initial cost of heat pumps it is important that in calculating heat losses they be figured as closely as possible in order to avoid oversizing systems. Mr. Lynch stated that this sizing should be about 75 percent of the normal weather design conditions established by the ASHVE GUIDE.

The third technical session with Vice Pres. Leon Buehler, Jr., presiding was held in the Agora theater, Wednesday morning, July 1. The papers presented included: Sound and Vibration Control, by R. L. Miller, Hartford, Conn.; Selection of Capillary Tubes for Domestic Refrigerators, Home Freezers, and Air Conditioning Units, by J. R. Prosek, Evansville, Ind.; Metastable Flow of Freon-12—Flow in Comparatively Stable Condition, by P. F. Pasqua, University of Tennessee, Knoxville, Tenn.; Corrosion Resistant Finishes for Air Conditioning Equipment, by P. O. Blackmore, Newark, N. J.

Among the highlights of the meeting was the welcome luncheon on Monday at which C. H. Linder, vice president — Engineering, General Electric Co., spoke on *What the Future Holds for Our Industry*. On Sunday night a program, *Beat the Clock*, was presented at the Agora theater by the members of the Central New York Section with audience participation. Monday night an outdoor picnic and steak fry was held at the Council Fire Grounds and was followed by a well attended square dance in the Agora theater. The meeting was climaxed on Tuesday night with the semi-annual banquet followed by a dance and the presentation of the golf trophies.

Thermal Performance of Frame Walls

Part II — Air Spaces Blocked at Mid-Height

By G. O. Handegord* and N. B. Hutcheon**, Saskatoon, Canada

SUMMARY—Studies of the thermal performance of frame walls previously reported have been extended to include an investigation of the effects produced by inserting horizontal blocking in walls with air spaces. Data are presented which illustrate the vertical variations in temperatures and heat flow rates resulting from convection within frame walls with blocking at mid-height when insulation is ideally applied and when insulation installed to form two air spaces is improperly sealed. Data showing the horizontal variation in surface temperature across walls due to the presence of studding with various forms of insulation are also given.

THE FIRST PAPER[1] presented on this subject dealt with the vertical variations in temperatures and heat flow rates resulting from convection in air spaces in frame walls. Some of the walls tested had insulation ideally applied while others in which insulation was installed to form two air spaces, had gaps left at the top and bottom. The air spaces were continuous over the height of the wall. The present paper deals with walls having horizontal blocking at mid-height, and is concerned, as was the first paper, with the deviations of actual heat flow and temperature patterns from those predicted by simple theory.

Blocking may be installed in frame walls to provide nailing girths and added rigidity. When used for these purposes it need not block off the air space completely. It is frequently required, however, as firestopping and to be effective, must present a barrier to vertical air movement. Walls with complete blocking may be expected to show two convection patterns over their height.

The effect of through framing members on overall wall conductance is usually calculated by one of two methods given in the HEATING, VENTILATING, AIR CONDITIONING GUIDE. In the first of these, the wall is treated as a series of separate parallel heat flow paths only, and in the second as a combination of series and parallel paths. Neither of these methods provides a rational basis for calculation of surface temperature under the actual conditions of heat flow in the wall.

The horizontal surface temperature variation in frame walls will be largely influenced by the type and arrangement of insulation in the wall. For example, consideration may be given to the two walls shown in Fig. 1 in which the same insulation has been installed in two different positions. In the left arrangement 1-a, the outer 1-5/8 in. of the studding is exposed to air at a low temperature while in the right arrangement 1-b, the entire stud is in a region of much higher temperature. It would be expected, therefore, that a greater heat flow would occur laterally from the stud shown in 1-a than that in 1-b, resulting in a lowering of surface temperature in the area over the stud.

When the vertical variations in temperature resulting from convection are also considered, it is seen that the heat flow is three dimensional and that the corresponding surface temperature pattern is complex, particularly in walls with blocking at mid-height. Since these variations are pertinent to any assessment of wall performance, the present study was extended to provide data on the heat flow and surface temperature pattern at points other than at the center of the stud space.

The project reported here was conducted as part of a program of Cold Weather Wall Research being carried on cooperatively by the University of Saskatchewan and the Division of Building Research, National Research Council, at Saskatoon.

Test Apparatus

The basic test apparatus employed has been described previously.[1] Closer regulation of air temperature on both sides of the panel was obtained by the use of resistance-thermometer bridge control systems in place of those originally used. This change involved no alteration in the air heating system on the warm side of the panel, but an intermittent electrical reheat system was substituted for the bypass damper arrangement formerly employed in the cold room.

A second track and carriage was installed on the baffle facing the warm side of the test panel opposite a stud location to permit simultaneous heat meter traverses vertically over a stud as well as between studding. Additional thermocouples were installed to measure wall surface temperatures over the stud and 2 in. from the stud at five different heights, at locations not immediately

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[1]Exponent numerals refer to references.
Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Denver, Colo., June 29-30, July 1, 1953.

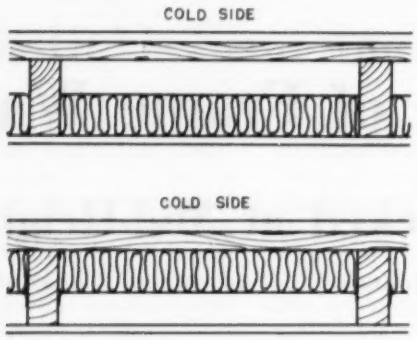

Fig. 1—Two methods of installing batt insulation

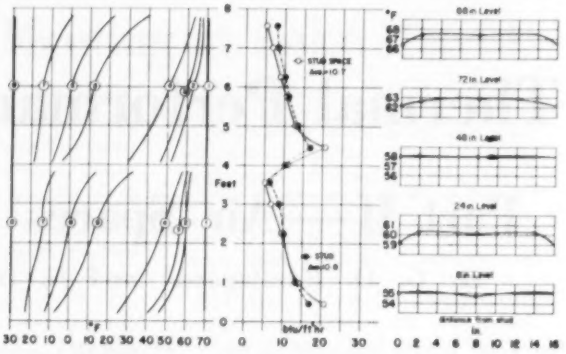

Fig. 2—Temperature and heat flow variation in wall No. 2
Single foil curtain creating two air spaces — Foil sealed to surrounding framing members

adjacent to the metal screws used in construction of the panel.

The heatmeters employed were of the multiple differential thermocouple type, with the sensitive elements mounted between synthetic resin sheets to form a finished meter 4½- by 4½- by 3/64-in. thick. The meter used to traverse the wall at the stud contained two thermopiles, each measuring ⅜- by 1½-in. spaced 1⅜-in. on centers. The meter was oriented with the 1½-in. dimension of the elements horizontal so that no portion of the thermopiles extended beyond the stud. The meter used to traverse the area at the center of the stud space contained four thermopiles each measuring ⅜- by 2-in. equally spaced, within an area 2- by 2⅝-in.

Table 1—Description of Curves

Wall Panel Number	Description of Insulation
1	Aluminum foil cemented to cold surface of plasterboard.
2	Single foil curtain creating two air spaces each faced one side with aluminum foil. Curtain sealed to surrounding framing members.
3	2-in. paper-enclosed mineral wool blanket insulation (actual thickness 1½-in.) creating two air spaces. Blanket sealed to surrounding framing members.
4	2-in. thick mineral wool batt insulation placed next to plasterboard to form one air space on cold side of insulation.
5	Same as 4 except batt placed against sheathing. Paper backing sealed to surrounding framing members.
6	Same as 5 except ⅛- by 14½-in. strips cut from paper backing at bottom and top of each air space.
7	Same as 2 with ⅛- by 14½-in. gap at top and bottom of each air space.
8	Same as 3 except blanket stapled but not sealed to surrounding framing members, staples 6-in. apart.
9	Same as 3 with ⅛- by 14½-in. gap at top and bottom of each air space.

Test Procedure

The same basic wall panel, 8-ft in height by five standard stud spaces in width, was used for all tests. As in the previous study, only the center three stud spaces were actually employed as test area, the outer two spaces being fully insulated with mineral wool insulation.

The test procedure was essentially the same as for the tests reported previously, except that cold room air temperatures were maintained at a more nearly uniform value, and heatmeter indications were recorded for a slightly longer period of time at each location.

Description of Walls Tested

The basic wall panel consisted of ⅜-in. plasterboard, inside on 2- by 4-in. (1½- by 3⅝-in. actual) studding spaced 16-in. on centers and 25/32- by 10-in. spruce shiplap sheathing, building paper and 6- by ½-in. bevel cedar siding on outside. The exterior siding and sheathing, and interior plasterboard were secured with wood screws and the siding was given three coats of oil paint. Joints between framing members and sheathing were sealed with masking tape.

A total of nine different wall constructions was studied, each with blocking at mid-height. Only three different types of insulation were used, but variations were introduced in certain details of application. The various panels tested are described in Table 1.

Walls Nos. 1, 2, 4, 5, 6 and 7 were similar to walls studied in the previous paper, except for the insertion of horizontal blocking at mid-height. The paper-enclosed blanket insulation installed in Walls 3, 8 and 9 was not used in the previous study.

Test Results

Test results are presented graphically in Figs. 2 to 10. The vertical variations in temperature at various locations through the wall at the center line of the stud space have been plotted at the left hand side with the numbering system employed for identification of the curves as shown in Table 2.

Table 2—Identification of Curves on Figs. 2-10

Curved Number	Location
1	Warm side air 1 in. from wall surface.
2	Warm side of plasterboard
3	Cold side of plasterboard
4	Air space ⅛ in. from plasterboard
5	Air space ⅛ in. from sheathing
6	Warm side of sheathing
7	Cold side of sheathing
8	Cold side air 2 in. from wall surface

The vertical variations in heat flow rates into the wall at the centerline of the center stud space and at the stud immediately to the left have also been plotted for each wall. The values shown were the average of at least two runs. The heat flow rates given were obtained from observed heatmeter millivoltages using the conversion data provided by the manufacturer, without further calibration. When the traverse of Wall

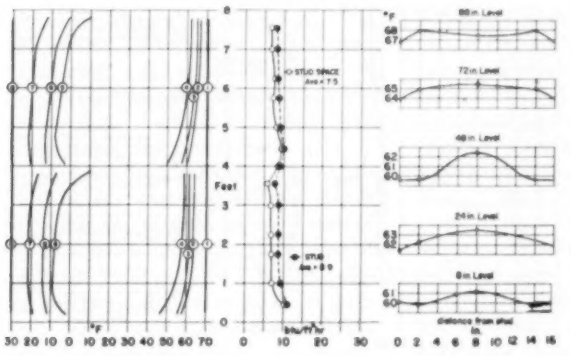

Fig. 3—Temperature and heat flow variation in wall No. 3
Two-inch mineral wool blanket insulation, creating two air spaces, sealed to surrounding framing members

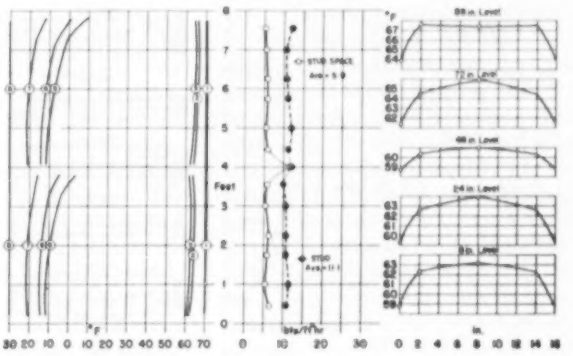

Fig. 4—Temperature and heat flow variation in wall No. 4
Insulated with two-inch mineral wool batt — Air space on cold side of insulation

No. 1 was repeated with the two meters interchanged the average percentage difference between corresponding readings was found to be within 2 percent.

Temperatures of the wall surface at locations over the stud immediately to the right of the center of the wall, 2 in. and 8 in. to the right of this stud are given in Figs. 2 to 10 for five different elevations. These measurements were, therefore, associated with the stud space adjacent to that in which the heatmeter data and additional temperature measurements were made.

Precautions were taken to prevent entry of water vapor into the warm room even though ambient conditions outside in the laboratory were of the order of 15 percent relative humidity or lower for most of the test period. Further protection against condensation was provided by painting the cold side of the plasterboard with two coats of aluminum paint followed with two coats of white oil paint. In spite of these precautions, some frosting occurred on the sheathing in all tests.

Heat Flow into Walls with Air Spaces

The effect produced by inserting horizontal blocking at mid-height was such as to create similar patterns of temperature and heat flow in the sections of the wall above and below the blocking. Each of these patterns was remarkably like those found over the full height of corresponding walls previously tested without blocking. All the walls with air spaces immediately behind the plasterboard showed rates of heat flow into the wall decreasing with height for each air space. This variation was in keeping with the temperature conditions throughout the wall, temperatures generally increasing with height for each space.

Of the walls in which insulation was ideally applied, those containing reflective insulation exhibited the greatest vertical variation in rate of heat flow into the wall. This feature, more fully discussed in the previous paper, can be attributed to the predominance of the effects of convective heat transfer with the reduction in radiant transfer across the space.

The openings left in the reflective curtain at the top and bottom of each air space in Wall No. 7 increased the average heat flow rate into the area between studding by 37 percent over that for Wall No. 2, but the variation with height was not

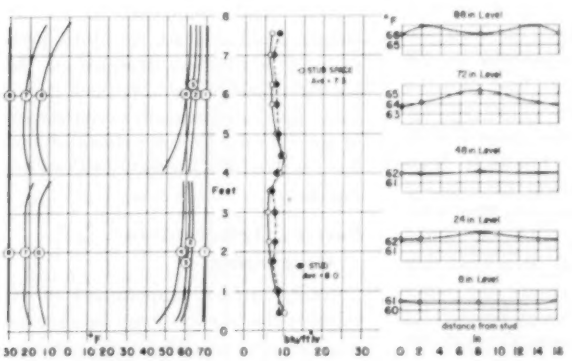

Fig. 5—Temperature and heat flow variation in wall No. 5
Insulated with two-inch mineral wool batt — Air space on warm side of insulation — Batt sealed to surrounding framing members

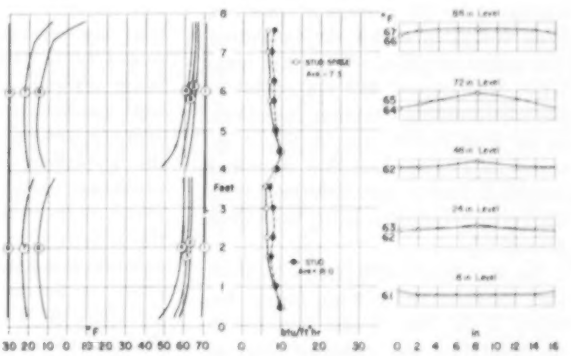

Fig. 6—Temperature and heat flow variation in wall No. 6
Insulated with two-inch mineral wool batt — Air space on warm side of insulation — Gaps of ⅛ in. cut in paper backing at top and bottom of each air space

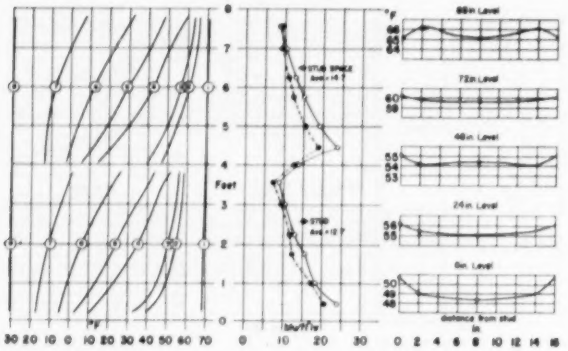

Fig. 7—Temperature and heat flow variation in wall No. 7
Insulated with single foil curtain creating two air spaces — Gap of ⅛ in. at top and bottom of each air space

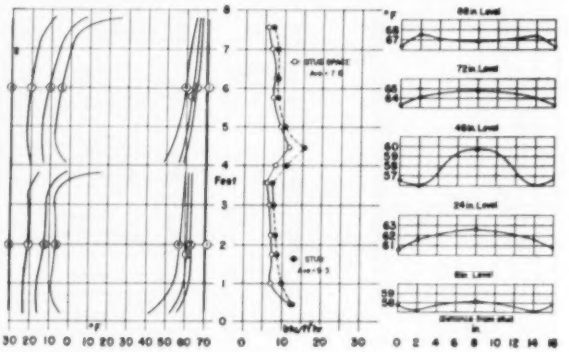

Fig. 8—Temperature and heat flow variation in wall No. 8
Insulated with two-inch blanket creating two air spaces — Blanket stapled but not sealed to surrounding framing members

as extreme. This may partially be accounted for by the fact that condensation had formed on the reflective curtain in Wall No. 2 during test, on an area extending approximately 8 in. from the bottom of each air space. This condensation undoubtedly affected the emissivity of the foil in this region and increased the heat flow into the wall.

The effects of air-space convection are apparent from a comparison of heat flow rates into the center of the stud space for Walls Nos. 3, 8 and 9 in which a mineral wool blanket insulation was installed. Wall No. 9, in which openings existed through the insulation at the bottom and top of each air space, showed the greatest vertical variation in heat flow of all the walls tested, the rate of heat flow into the wall at the 5-in. level being 3 times the average. In addition the average rate of heat flow increased by 21 percent of that for Wall No. 3 in which the insulation was sealed in place. When the insulation was stapled, but not sealed to the surrounding framing members, as in Wall No. 8, only a slight increase in average heat flow over that for Wall No. 3 was observed, with the vertical variation being somewhat greater.

No significant differences in thermal characteristics were found between Walls Nos. 5 and 6 although the insulation was sealed in place in Wall No. 5 and ⅜- by 14 ½-in. openings were cut through the paper backing of the insulation at the top and bottom of each air space in Wall No. 6. This close agreement suggests that little or no air movement occurred through the insulation.

The results shown here, as in the previous paper, indicate that the location of semi-thick batt-type insulation affects both the variation in heat flow with height and the average heat flow rate at the center of the stud space. The greater variation in heat flow vertically in Wall No. 5 can be considered as due to convection in the air space behind the plasterboard.

The presence of this air space makes it possible for heat to enter at one point and leave at some higher point. It is equally possible, however, for heat to enter the convective air stream through the area between studs and be transported laterally to, and leave by, the stud path. This can account for the higher average heat flow between studs for Wall No. 5 and is, in fact, supported by the lower readings of heat flow into the wall opposite studs. When no air space is present on the warm side of the insulation, only relatively high resistance paths to heat flow in the plane of the wall are provided until the air space on the cold side of the insulation is reached. It follows that some of the heat enters the outer air space in Wall No. 4 by way of the stud path and leaves through the sheathing between studs.

In all the walls studied, the vertical variation in the rate of heat flow into the area over studding was very similar to the variation existing in the area between studs. Since such vertical variations can only be attributed to the change in air space temperature with height, it is obvious that the rate of heat flow into studding is influenced to a great extent by the air temperature conditions to which the sides of the stud are exposed. This provides further evidence of the importance of lateral heat exchange between studs and air spaces in determining the overall pattern.

Further consideration might be given to comparison of measured heat flow rates into studding and into the stud space for the walls tested. Some doubt exists, however, as to the calibration corrections to be applied to heatmeter readings when there has been a change in the arrangement of material on which the heatmeter is placed. Such comparison on a strict quantitative basis has, therefore, been reserved until these features of the heatmeter technique have been evaluated, but there seems to be no reason to question the overall pattern of heat flow which the uncorrected values imply.

Surface Temperature Distribution

Inside surface temperatures of exterior walls have a direct bearing on some aspects of indoor comfort conditions, on the performance of panel heating systems, on surface condensation problems and on the formation

of dirt patterns on walls. It is of some importance, therefore, to note the very substantial deviations of actual surface temperature patterns from those implied by simple unidirectional heat flow theory.

Nielsen[2] has discussed the problem of dust marking and has shown it to be due to differences in rate of accumulation on adjacent areas at different temperatures. Rogers[3] suggests that a difference of from 3 to 5 F deg in wall surface temperatures may produce noticeable dust patterns. It may be noted that using this criterion, Wall No. 4 may exhibit dust marking over studding, while all the walls except Nos. 4, 5 and 6 may exhibit dust marking just above horizontal blocking. It is not correct, therefore, to assume that the application of insulation will necessarily eliminate the tendency to noticeable dust marking.

Surface condensation will occur whenever the wall surface temperature falls below the dew point temperature of the air. Potential areas for surface condensation will invariably be found at the lower portion of a wall. When the wall construction is such as to produce a high variation in surface temperature vertically over the area between studs the coldest area will tend to be at the bottom of this vertical zone. When, however, the wall arrangement is such as to produce high heat flow into the studs, the convection effects over the center of the space will not be so marked and the coldest area will be opposite the studding. The effect of leakage between air spaces is to exaggerate the vertical variation in surface temperature between studs. All the walls except No. 4 show predominating convective effects and in none of these is the area over studs markedly colder than the area between studs. Wall No. 4, however, has small vertical variations in surface temperature, since the convective effects are restricted to the cold side of the insulation. For the same reason, the heat flow through the studding tends to be high and the coldest area is to be found opposite studding.

Wall No. 4, showing the greatest horizontal variation in surface temperature at the lower portion of the wall does not represent the worst possible case of such variation. In many practical installations, the insulation will not be installed to fit tightly against the studs for its full thickness and relatively lower surface temperatures over studs may be expected as a result of the increased heat flow through studs. The most extreme case known to the authors is for a form of insulation not represented here where leakage existed and the convective effects combined with high heat flow through the studs to produce, not only high variations in temperature vertically, but also extremely low temperatures over studs.

It may be noted that although Wall No. 4 exhibited the greatest horizontal variation in surface temperatures over the lower portion of the wall, Walls Nos. 1, 2, 7 and 9 exhibited much lower surface temperatures in this region. The lowest surface temperature measured at the 3-in. level on Wall No. 9 was 39 F which would permit an inside relative humidity of only 32 percent at 70 F before condensation occurred. This applies to the test conditions of an inside to outside air temperature difference of 100 F deg which although severe for most of the United States, is not unrealistic for the northern part of the continent. All tests, however, were carried out with room air temperatures maintained reasonably constant over the height of the wall. In actual practice some further lowering of surface temperatures at the lower portions of walls may result from reduced room air temperatures at floor level or from contact with cold floors or foundations.

Conclusions

The following conclusions have been drawn from the test results and observations:

1. The heat flow and surface temperature patterns in frame walls are greatly influenced by movement of heat in the plane of the wall.
2. Substantial movement of heat in the plane of a wall occurs largely as a result of convection in air spaces coupled with heat interchange between air spaces and framing members.
3. Vertical variations in both temperature and heat flow are related to the convection in air spaces and can be exaggerated by air leakage into or between air spaces.
4. Horizontal variations in both temperature and heat flow are related not only to the type but also to the arrangement of the material used for insulation, and particularly to the thermal resistance provided over the area between studs before an air space is reached.

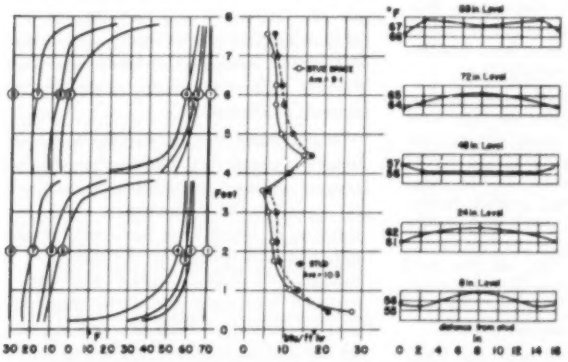

Fig. 9—Temperature and heat flow variation in Wall No. 9
Insulated with two-inch blanket creating two air spaces — Gaps of ⅜ in. at top and bottom of each air space

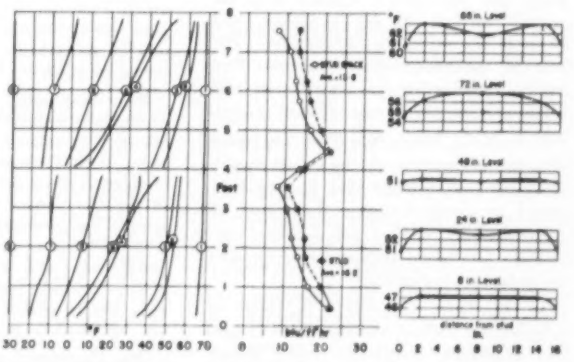

Fig. 10—Temperature and heat flow variation in wall No. 1
Aluminum foil cemented to cold surface of plaster board

5. The characteristic pattern of temperature and heat flow resulting from convective effects is not greatly changed by reducing the free height of the air space from 8 ft to 4 ft and in a wall with horizontal blocking at mid height will be substantially repeated over each blocked-off area.

6. Blocking at mid height may produce potentially serious conditions for dust marking in the area immediately above blocking.

7. The improvement to be obtained through the use of insulation, in tendency toward dust marking and surface condensation depends not only on the insulation but also on the thermal properties of the overall arrangement created.

Acknowledgment

The authors wish to acknowledge with thanks the assistance given them in the taking and recording of data by other members of the staff of the Prairie Regional Station, Division of Building Research, *National Research Council*.

References

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2. Dirt Patterns on Walls, by R. A. Nielsen (ASHVE TRANSACTIONS, Vol. 46, 1940, p. 247).

3. Design of Insulated Buildings for Various Climates, by T. S. Rogers (F. W. Dodge Corp., 1951).

Discussion

E. R. Queer, State College, Pa., remarked that in conducting research on reflective insulation about 20 years ago he had found that horizontal blocking of the air spaces had relatively little effect on the heat transfer coefficient until the height of blocking was reduced to a 24-inch height. Upon further decrease of blocking height the heat transfer coefficient was increased.

R. K. Thulman, Washington D. C., stated that the use of insulation in residence walls in the United States had lagged far behind its use in ceilings and further, the amount of insulation used in walls was usually less than in ceilings. The data in the paper seemed to indicate that the variation of the coefficient of heat transfer in relation to the height was greater as the effectiveness of the insulation decreased.

He pointed out that the tests were conducted with a uniform temperature gradient on the warm side, the variation in temperature being only a degree or two. In field installations the temperature gradient is far from uniform when heating systems are in operation. The type of system and the climate affect the gradient. Mr. Thulman had observed floor-to-ceiling temperature differences as high as 100 deg in a small house in Philadelphia where the temperatures at floor and ceiling were 40 F and 140 F respectively. While this difference is unusual it is not unusual to find 40 deg variations, and 10 to 20 deg variations are common. The data in the paper seemed to have very definite application to construction and conditions found in the United States.

D. L. Mills, Rome, New York, suggested that the information in the paper was so practical and valuable that it should be stated in simple language that could be understood by builders and building contractors who might thereby be encouraged to improve construction.

G. L. Tuve, Cleveland, O., inquired whether the authors had succeeded in having insulation contractors make proper installations in Canada. He reported that in building two houses during the last two years it was necessary to be present during the installations in order to insure good workmanship. He emphasized the importance of improving installation practice in the field.

W. A. Danielson, Raleigh, Tennessee, stated that from his experience it was evident that the temperature gradient within a room was proportional to the heat loss, or in other words, a high temperature at the ceiling and low temperature at the floor would result if the room had a high heat loss. He proposed that an attempt should be made to apply insulation in such a way that it would be in contact with both sides of the studs as well as the wall. With such installation the stud would be insulated from the air space.

W. O. Huebner, New York, New York remarked that those who are concerned with the problems of air distribution would be interested in the comments made in the paper on the effect of temperature differences of adjacent portions of walls upon the smudging of the walls.

D. B. Anderson, St. Paul, Minnesota pointed out that manufacturers of insulation were well aware of the importance of educating contractors to insure proper application of insulation. He mentioned that films had been found effective in the education process.

He referred also to previous work in which Professor Rowley had shown that gaps left at the top and bottom of insulation in walls had caused a heat loss increase as much as 25 percent.

Mr. Handegord, in referring to Mr. Thulman's comments, stated the tests were not directly related to actual practice because it was necessary to util²ze forced circulation over both sides of the panel in the direction of normal gravity convection. The velocities over the surface were within a range up to 200 fpm on the warm side and 250 fpm on the cold side. The object of using forced circulation was to obtain as uniform a vertical air temperature gradient as possible.

Mr. Handegord agreed with Mr. Thulman that where inadequate insulation is used it is to be expected that the temperature gradient between floor and ceiling will be high. He cited a case in which the temperature at the floor was 40 F while that at the ceiling was over 110 F. In this same installation the effect of heat flow through the wall studs was quite noticeable in producing not only dust marking and also in causing surface condensation in the form of frost at the baseboard level and extending along each stud as high as 3 ft from the floor. Referring to Mr. Mills suggestion, Mr. Handegord remarked that the National Research Council of Canada will publish a Better Building Bulletin containing suggestions for contractors wishing to make correct application of insulation. As an instance of the importance of proper application he pointed out that two inch insulation placed immediately behind the plaster resulted in a lower coefficient for the wall than the application of the insulation against the sheathing.

With regard to General Danielson's remarks Mr. Handegord stated that further investigation is to be carried on to determine the effect produced by insulating the portion of the stud which is not normally covered by the two inch bat insulation. The authors' experience with contractors had indicated that application instructions were very important. Due to the cold climate it was common practice in Canada to fill the air space with insulation, and consequently there was less liability to have air spaces at the tops or bottoms of the walls.

The problem of dust marking had been quite prominent in the authors' experience because of the cold weather encountered in Canada. Mr. Handegord cited one instance in which used rock wool insulation had been placed in the ceiling of a temporary building. Since this was a ceramics laboratory where the dust content of the air was high the dust marking on the ceiling indicated the spaces in the ceiling which the contractor had failed to cover with insulation.

Electrical Analogger Application to the Heat Pump Process

By Carl F. Kayan*, New York, N. Y.

SUMMARY—This paper covers the application of the method of the electrical Analogger to a compression refrigerating system discharging its heat energy to a condenser system operating with different fluid temperatures and different fluid circulation rates. Herein the performance characteristics of the two major elements under different temperature conditions is recognized and embodied in the Analogger system.

REFRIGERANT-VAPOR compression systems, whether for heat-pump or for refrigerating purposes, will operate in steady state at some equilibrium condition determined by relative component performance characteristics. This means that the condensing temperature and the compressor delivery pressure, under fixed evaporator conditions, are the result of comparative performance characteristics of both the condenser and the compressor, as subject to their imposed conditions. Thus, variations in the condenser coolant conditions will be reflected in a variation of the condensing temperature; this, in turn, will affect the resultant compressor performance.

These interdependent relationships for the system may be investigated by electrical Analogger methods, wherein system performance values may be represented by electrical quantities. The use of electrical analogy methods for the study of various steady-state heat-flow systems is well known,[1,2,3,4,5] and likewise so for transient or unsteady-state systems.[6]

For the purpose of clarification and simplification in this initial presentation, many expedient assumptions will be in order and will be made. Idealized performance will be assumed; corrections to specific practical performance of real equipment may readily be made. The present paper is prepared essentially for the purpose of introducing another tool in the electrical Analogger operations. This tool, in general, may serve for the ready determination of overall performance characteristics in the analysis of composite integrated systems comprising fluid machines and associated heat transfer equipment under various imposed conditions and heat load.

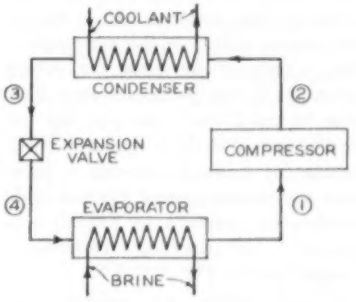

Fig. 1—Schematic layout of vapor compression circuit

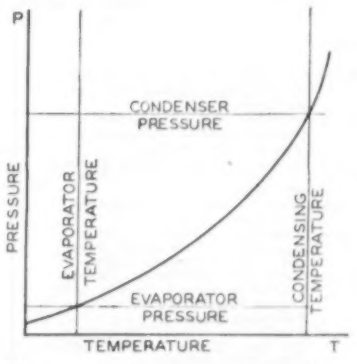

Fig. 2—Typical pressure-temperature curve for refrigerant, with cycle terminal conditions indicated

General Aspects of the Vapor Compression Cycle

The conventional refrigerant-vapor compression system, in terms of a simple component circuit, is illustrated in Fig. 1, and is familiar to all. Power is supplied to run the compressor; heat is abstracted in the condenser through the medium of a coolant such as water flowing at a given rate; heat is supplied to the evaporator by brine of a refrigerating system, by chilled-water of an air-conditioning system, by atmospheric air flow of an air-source heat pump system, or perhaps by waste warm liquid in an industrial heat pump process.[7]

The pressure-temperature relations for a refrigerant are indicated in Fig. 2, with pressure-temperature levels of system operation shown in Fig. 3, and general corresponding fluid heat-transfer temperatures indicated in Fig. 4. Pressure difference ΔP and the corresponding temperature difference Δt effected by the thermodynamic system are likewise indicated in Fig. 3. The pressure-enthalpy (P-h) diagram for an ideal refrigerant cycle is shown in Fig. 5 with particular reference to component enthalpy differences Δh, *i.e.*, for evaporator, compressor and condenser.

Compressor Plant

For the purposes of this paper a positive displacement compressor system with the usual machine suction and discharge valves is assumed. Equivalent analysis, however, could be carried out with other types of compressor systems. The performance of the compressor depends on its construction features, *i.e.* the ideal displacement gas volume is modified by the effect of the overall volumetric efficiency. Clearance in conjunction with pressure ratio, pressure drops in valves, suction gas heating, as

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[1]Exponent numerals refer to References.

Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Denver, Colo., June 29-30, July 1, 1953.

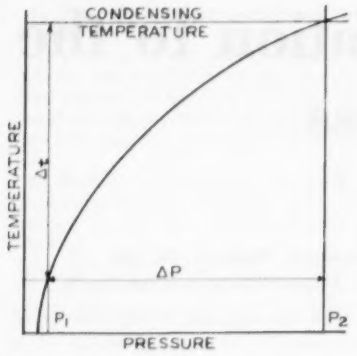


Fig. 3—Cycle temperature-pressure curve

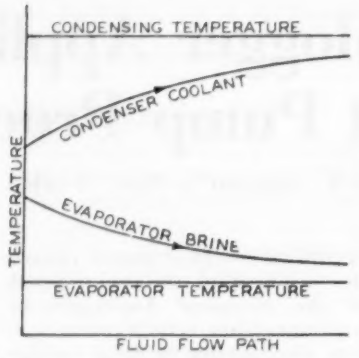


Fig. 4—Typical system heat-transfer temperature relationships

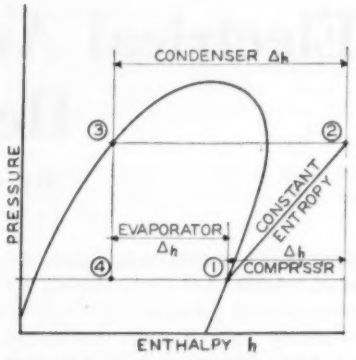


Fig. 5—Pressure-enthalpy relationships for typical refrigerant cycle

well as the specific gas properties, directly affect the effective gas handling capacity, as measured by *real* volumetric efficiency. On an idealized basis, without considering pressure drops through suction and delivery valves, and suction heating, the volumetric efficiency may be shown as:

$$E_v = 1 + C - C\,(P_2/P_1)^{1/n} \quad \ldots\ldots(1)$$

The ideal volumetric efficiency, though itself less than 100 percent, is still further reduced by the practical effects of valve drops and heating of suction gas. Fig. 6 shows the general variation of the hourly mass of gas handled *vs.* gas delivery pressure, for $E_v = 100$ percent (unimpaired displacement), ideal volumetric efficiency as given by Equation 1, and the real volumetric efficiency of a practical machine. Fixed suction pressure is assumed.

Vapor Cycle

Based on fixed suction conditions such as suction pressure and suction gas quality, and variable discharge pressures, the ideal compressor work per pound of refrigerant (at constant entropy) may be calculated. Similarly, based on the assumption of liquid refrigerant leaving the condenser at the temperature corresponding to the condensing pressure and entering the pressure drop device (expansion valve) at the same condition, values of the heat per pound given up in the condenser may likewise be calculated; and also for the heat absorbed in the evaporator. Such values for a fixed evaporator pressure are shown plotted against cycle condensing pressure in Fig. 7, and against corresponding condensing temperature in Fig. 8.

Using values of pounds gas pumped per hr from Fig. 6 as based on real volumetric efficiency, and combined with the data of Fig. 8, equivalent hourly heat values representing practical performance are obtained and shown in Fig. 9. It is immediately evident that the heat to be rejected in the condenser is made up of that acquired in the evaporator plus that contributed by the work effect accomplished in the compressor.

Application of the Resistance Concept

Condenser Heat Transfer

Disregarding the effect of superheat on condenser performance, the flow of heat in a refrigerant condenser may be considered to vary with the temperature difference between the condensing temperature and the inlet coolant temperature,

Nomenclature

A = heat transfer surface area, square feet.
C = clearance fraction, based on displacement.
c = coolant mean specific heat, Btu per (pound) (Fahrenheit degree).
E_v = volumetric efficiency.
n = exponent in Pv^n = Constant (ideally $n = k = c_p/c_v$.)
P = pressure, pounds per square inch, absolute.
ΔP = pressure difference between evaporator and condenser, pounds per square inch.
P_1 = intake pressure of compressor, pounds per square inch.
P_2 = delivery pressure of compressor, pounds per square inch.
q = heat energy as applied to different elements of the system and identified by subscripts, Btu per hour.
R_e = heat exchange resistance, thohms = Fahrenheit degrees per (Btu per hour).
R_t = equivalent thermal resistance for condenser process, Fahrenheit degrees per (Btu per hour).
R_{UA} = net heat transfer resistance, thohms = $1/(UA)$ Fahrenheit degrees per (Btu per hour).
r = electrical resistance corresponding to thermal, ohms.
Δt = temperature difference between evaporator and condenser saturation values, Fahrenheit degrees.
Δt_c = temperature difference between condensing temperature and inlet coolant temperature on condenser, Fahrenheit degrees.
U = overall heat transfer conductance, Btu per (hour) (square foot) (Fahrenheit degree).
W = pounds coolant per hour.

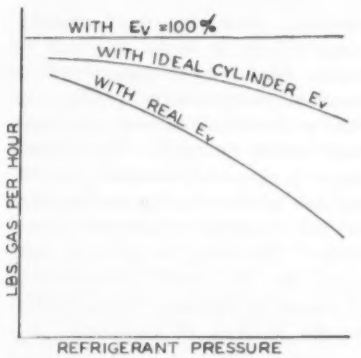


Fig. 6—Typical variation of compressor gas pumping rate with refrigerant discharge pressure, for different volumetric efficiency conditions, constant suction pressure

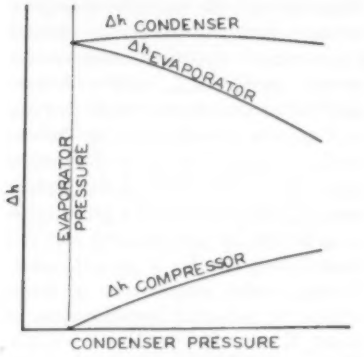


Fig. 7—Typical variation of component energy values per pound with condenser pressure, constant evaporator pressure

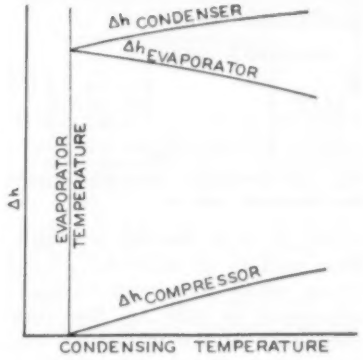


Fig. 8—Typical variation of component energy values per pound with condensing temperature, for constant evaporator temperature

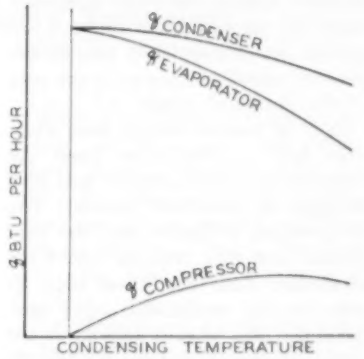


Fig. 9—Variation of compressor energies per hour with condensing temperature, for constant evaporator temperature and including compressor volumetric efficiency effect

with fluid temperature relationships as shown in Fig. 10. As indicated in an earlier paper,[5] the hourly heat transfer may be shown in terms of resistance:

$$q = \Delta t_t / R_t \quad \text{.....(2)}$$

$$R_t = \frac{R_c}{(1 - 1/e^{R_c/R_{wa}})} \quad \text{.....(3)}$$

$$R_c = 1/(Wc) \quad \text{.....(4)}$$

$$\Delta R_t = R_t - R_c \quad \text{.....(5)}$$

These relationships are shown on a general basis in Fig. 11, with values plotted against coolant flow rate, W.

Energy Transfer in Machines

Considering the *energy relationships* for a compressor system as shown in Fig. 9, just as the *resistance concept* has been extended to cover heat exchanger transfer due to overall temperature difference,[5] so may it similarly be extended to cover energy flow in a machine, as for example, in a compressor. Equivalent resistance values may be used to represent the compressor performance of the present system. Assuming a fixed evaporator pressure and corresponding temperature, and a variation of compressor performance in terms of the overall temperature difference on the system, resistance values may be obtained by dividing the temperature difference by hourly heat quantities:

$$R = \Delta t / q \quad \text{.....(6)}$$

Fig. 12 shows resistance values plotted against temperature difference, as follows:

R_{evap} = resistance value corresponding to hourly evaporator heat.

R_{cond} = resistance value corresponding to hourly condenser heat.

R_{work} = resistance value corresponding to hourly compressor work.

Electrical Analogger Circuit for System Studies

Using electrical resistance values proportional to the thermal resistances cited in Figs. 11 and 12, an electrical Analogger circuit may be arranged to facilitate ready evaluation of heat pump or refrigeration system performance under different operating conditions. Although the use of other driving forces such as enthalpy differences could be considered, temperature difference seems to offer the greatest advantage, with electrical voltage as its counterpart. Furthermore, as far as the compressor system is concerned, although a

Fig. 10—Condenser heat-transfer temperature variation *vs.* coolant flow path

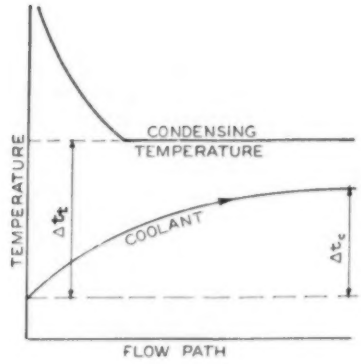


Fig. 11—Typical variation of condenser thermal resistances and UA value with coolant flow rate

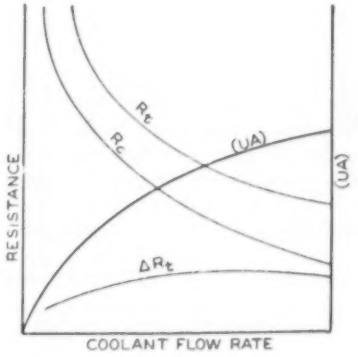
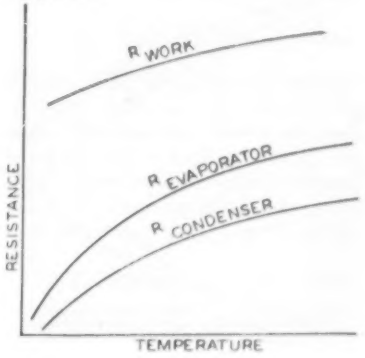


Fig. 12—Typical variation of compressor component-energy resistances with condensing temperature, for fixed evaporator temperature



variable voltage electrical generator might be employed, the simplest approach appears to be to use an impressed overall voltage as in the case of the condenser system.

It is of course obvious that whatever heat is discharged from the compressor system must in turn flow through the condenser system. The temperature difference that the condenser heat flow requires under the condenser fluid conditions must in turn set the condensing vapor temperature; this in turn determines the corresponding compressor delivery pressure. The actual compressor system energy, depending on real volumetric efficiency and hourly displacement, is directly dependent on the delivery pressure.

In setting up the Analogger circuit, separate adjustable resistances, in parallel, and representing the combined compressor work and the evaporator phases, are employed. The sum-total current contributed by these two branches must in turn equal the total flowing in the condenser circuit, with the same top potential in effect for both phases. Potential level corresponding to the condenser inlet coolant temperature is maintained on the condenser circuit, using an adjustable ballast resistance. (If, beyond the condenser, the evaporator

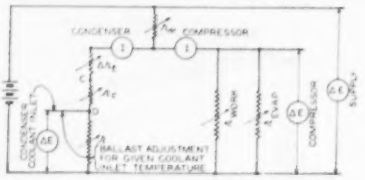


Fig. 13—Electrical Analogger circuit for heat-pump process

circuit is to be detailed separately, there must be an additional parallel circuit whose flow must obviously correspond to that for the work-component on the compressor side. Thus the circuit below the condenser would have two branches.)

Fig. 13 shows the simulation circuit, with resistances for R_c and ΔR_t adjustable in accordance with coolant flow rate derived from a working curve such as Fig. 10 for the specific compressor-matching condenser of the system. Fluid temperature corrections may be introduced into Fig. 10 if desired. Also shown in Fig. 13 are resistances for the compressor-work and the evaporator-energy components, adjustable to keep step with the overall value of the compressor-plant potential, in conformance with the appropriate compressor-plant performance characteristic as shown in Fig. 12.

Adjustment of the circuit is made by changing the top-side potential value through the variable resistance r_v, such that the condenser current I_{cond} equals the total compressor-energy current I_{comp}, and with parallel minor corrections made in r_{work} and r_{evap} in accordance with the operating overall potential differences (Fig. 12). The effect of the coolant entering temperature of a given value is achieved by maintaining the potential at point D at proper value. Coolant outlet temperature is determined by potential measurement at point C on the condenser circuit. The various current meters show the equivalent energy flowing at any given point. Adjustment of the different elements of the Analogger for this type of heat-power system is a matter of manual dexterity, somewhat simplified by the use of automatic equipment, such as, for example, a voltage regulator.

Example

Figs. 14 and 15 show data for a given vapor-compression system, with ammonia as the refrigerant and the evaporator operated at a fixed temperature of 0 F. With allowance for *real* volumetric efficiency as illustrated in Fig. 6, hourly heat values as typically illustrated in Fig. 9 are shown in Fig. 14. Corresponding resistance values as calculated according to Equation 6 are likewise shown on the diagram, as *thohms*. Fig. 15 shows values for the condenser typified by Fig. 11, and calculated according to Equations 4 and 5.

Fig. 14—Variation of compressor system component energy rates and equivalent resistances with condensing temperature, for fixed evaporator temperature (numerical example)

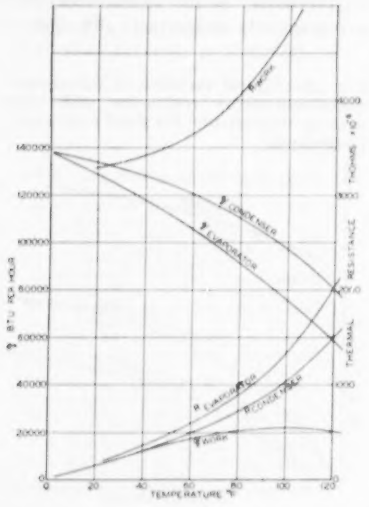


Fig. 15—Variation of condenser *UA* and corresponding thermal resistances with coolant flow rate (numerical example)

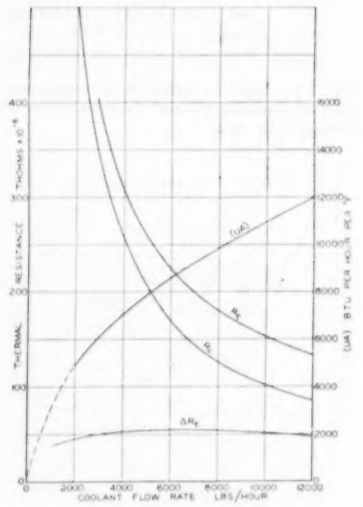
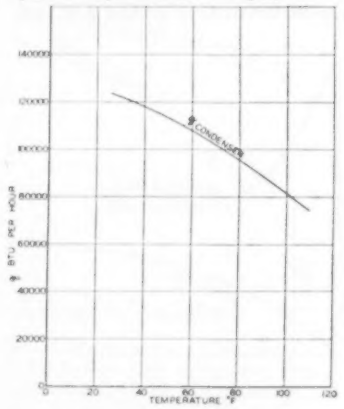


Fig. 16—Variation of condenser heat per hour with inlet water temperature (numerical example)



Values for the product UA are included, all values being plotted against hourly rate of condenser coolant (water) circulation. (Compressor displacement, cfm, = 37.3; condenser heat transfer surface = 56.2 sq ft).

Circuit values, as translated from Figs. 14 and 15 for the arrangement of Fig. 13, are on the basis of 1 ohm electrical resistance = 10^{-6} thohms, 0.10 volt = 1 F; 0.100 amp = 1,000,000 Btu per hr.

Fig. 16 shows the variation of condenser heat, in Btu per hr, *vs.* inlet water temperature, with a fixed flow rate of 6,000 lb water per hour for the condenser with evaporator at 0 F.

Acknowledgment

Acknowledgment is gratefully made to associates of the author who have cooperated in various aspects of this study, particularly Prof. J. A. Balmford of the Electrical Engineering Department, and Messrs. P. R. Ellard and D. W. Blair of the Mechanical Engineering Department, Columbia University.

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2. Effect of Floor Slab on Building Structure Temperatures and Heat Flow, by C. F. Kayan (ASHVE TRANSACTIONS, Vol. 53, 1947, p. 377).

3. Temperature and Heat Flow for a Concrete Slab with Imbedded Pipes, by C. F. Kayan (*Refrigerating Engineering*, Vol. 54, August 1947, p. 143).

4. Fin Heat Transfer Analysis by Electrical Analogy, by C. F. Kayan (*Industrial Engineering Chemistry*, Vol. 40, 1948, p. 1044).

5. Heat Transfer Equipment Analysis by the Resistance Concept, by C. F. Kayan (*Refrigerating Engineering*, December 1951).

6. Periodic Heat Flow in Building Walls Determined by Electrical Analogy Method, by Victor Paschkis (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, February 1942, p. 133).

7. Heat Pumps in Heat Recovery, by C. F. Kayan (*Chemical Engineering*, Vol 57, May 1950, p. 146).

Clark M. Humphreys Appointed Acting Director of ASHVE Research

APPOINTMENT OF Clark M. Humphreys as Acting Director of Research for ASHVE was made by the Council on June 29 at the Semi-Annual Meeting in Denver, Colo., upon recommendation of the Committee on Research.

Since 1945 Mr. Humphreys has served as Senior Engineer at the

C. M. Humphreys

Society's Research Laboratory, Cleveland, and recently supervised the work on the human calorimeter and the construction of the Environment Laboratory and Odor Rooms.

Mr. Humphreys was born in Kenton, Ohio, and after graduation from its public schools he attended Ohio State University, where he received his B.M.E. in 1925. After six years in the Office of the State Architect and Engineer, Columbus, where he prepared designs and specifications of heating, ventilating and plumbing systems for state buildings and institutions, he joined the teaching staff of Carnegie Institute of Technology, Pittsburgh, Pa. in 1931.

In the same year he became a member of ASHVE and served on its Council from 1936-38. He was chairman of the Guide Publication Committee in 1942, and has served on many of the research technical advisory committees, including Weather Design Conditions, Air Flow in Ducts and Instruments.

Mr. Humphreys participated in the work of the Pittsburgh Chapter of ASHVE, and served as its president in 1942 and as a member of its Board of Governors in 1943.

While a professor at Carnegie Institute of Technology, Mr. Humphreys acted as Director of the Society's Research Laboratory at Pittsburgh during part of 1942 and 1943, after the late Dr. Ferry C. Houghten was called into active service with the Navy.

Mr. Humphreys has an extensive background in the mechanical engineering field and wide experience in heating and ventilating design, as well as an excellent record as a teacher and writer on technical subjects. In recent years he has contributed many important research papers as a result of laboratory studies and investigations carried on by the Society.

Parmelee on Leave with U.N.

G. V. Parmelee, research associate at the ASHVE Research Laboratory in Cleveland, left on July 10, via Pan American Airways, for Switzerland, and with his family will spend a brief vacation touring

G. V. Parmelee

France and Italy. He will then go to Israel as a U.N. technical assistance expert to give advice on problems connected with improving indoor climate research there, with particular emphasis on means of natural ventilation and protection from the sun.

During his service with the U.N. he will be on a leave of absence from the Society's Research Laboratory.

Mile-High Semi-Annual Meeting Successful

A NEW RECORD of 618 for the Semi-Annual Meeting attendance was set by 273 Members, 234 ladies and children and 111 guests who met at the Shirley-Savoy Hotel, Denver, June 29 to July 1.

The holiday spirit was evident as many members brought their families and planned to visit scenic spots of the West before returning home. The Council and Committee Meetings and four Technical Sessions were well attended and much serious Society work was accomplished.

The General Chairman of the Committee on Arrangements was Fred Janssen and the General Vice Chairman was E. A. Thompson. They were assisted by the members of the Rocky Mountain Chapter and their wives.

Red Rocks with Mrs. Reg. F. Taylor and W. M. Wallace, II

FIRST SESSION, MONDAY, JUNE 29, 9:30 A.M.

President Reg. F. Taylor called the meeting to order at 9:30 a.m. in the Empire Room of the Shirley-Savoy. He expressed his appreciation of the work of the Committee on Arrangements which had everything in readiness for entertainment and instruction of the Members and guests.

General Chairman Fred Janssen gave a brief outline of the plans made to enable the Members and guests to enjoy the exciting features of the Colorado mountains.

President Taylor spoke of the great loss the Society had suffered on the death of Mr. Cyril Tasker, Society Member and Director of Research, and called on First Vice-Pres. L. N. Hunter who presented the following resolution prepared by Mr. Hunter, I. W. Cotton and A. W. Edwards:

The sudden and untimely decease of Cyril Tasker on May 27, 1953, brought a poignant loss to the ASHVE and to our profession.

Mr. Tasker was a loyal active member of the Society for many years, having been President of Ontario Chapter and a member of the Council.

His service as Director of Research began in 1943. With the removal of the Laboratory from Pittsburgh to Cleveland, he recruited a new staff and built an effective organization which functioned in new quarters as a dynamic activity. The loyalty and affection of his association testify eloquently to his capacity as an administrator.

A tireless worker, he carried out his responsibilities as Director of Research conscientiously and effectively.

The engineering profession recognized Mr. Tasker as an international authority in his field. He wrote and spoke convincingly, with refreshing absence of stilted professionalism.

The Council of ASHVE, recognizing the great loss in his passing, directs that this expression of sadness and appreciation be spread on Council minutes and published as representing the sentiments of the Society; and further directs that a copy be sent to Mrs. Tasker as an expression of sympathy from the entire Society membership.

Respectfully submitted,

L. N. HUNTER, *Chairman*
I. W. COTTON
A. W. EDWARDS

John W. James presiding at First Session, with Tohru Inouye presenting his paper

Judge B. C. Hilliard welcomes ASHVE to Denver

Mr. Hunter moved the adoption of the resolution which was seconded and adopted unanimously.

At this point President Taylor announced with regret that word had just been received of the death of Past President F. E. Giesecke in New Braunfels, Tex. on June 27. He appointed a committee composed of D. M. Mills, L. N. Hunter and John W. James to prepare a suitable resolution with reference to Dr. Giesecke.

In tribute to the memory of Dr. Giesecke and Mr. Tasker the audience rose and stood in silence for one minute.

The following Committee on Resolutions for the Semi-Annual Meeting was appointed with instructions to report at the final technical session on July 1: M. W. Bishop, Chicago, Ill., Chairman; W. J. Collins, Jr., Oklahoma City, Okla., and F. H. Faust, Bloomfield, N. J.

By-Law Amendments

President Taylor recognized Ross Forney, Dallas, Tex., who presented a written petition signed by 53 Society members proposing an amendment to *Article VIII, Section 7* of the By-Laws.

The motion as made by Mr. Forney and seconded was:

Resolved, That the last sentence of *Article VIII, Section* 7: . . . "The elected candidates shall be installed and their terms shall commence, at the close of the last session of the Annual Meeting," shall be deleted and the following be substituted:

". . . The elected candidates shall be installed at the banquet customarily held at the Annual Meeting, or, if no banquet is held, at a time during such Annual Meeting to be determined by Council."

L. N. Hunter stated that the Charter and By-Laws Committee and the Council felt that the purpose of the proposed amendment could be achieved without imposing restrictions which might become cumbersome by changing the proposed resolution. He offered the following amendment:

Resolved, That the last sentence of *Article VIII, Section* 7, of the By Laws be amended to read as follows:

". . . The elected candidates shall be installed during the Annual Meeting and their terms shall commence at the close of the last session of the Annual Meeting."

It was moved by Mr. Hunter, seconded and voted that the amendment as amended be approved and submitted for Society vote at the Annual Meeting 1954 in Houston.

Vice-President Hunter, as chairman of the Standards Committee, stated that after careful consideration by the Standards Committee it was recommended that the Standards Committee be changed from a Council Committee to a General Committee of six members. Mr. Hunter therefore offered the following resolution, unanimously approved by the Council:

Resolved, That *Article VII, Section* 2 (e) of the Society's By Laws be deleted, and

Be it further Resolved, That *Article VII, Section* 3 of the By-Laws be amended by adding thereto a new subdivision (j) reading as follows:

(j) Standards Committee, consisting of six (6) Members. The said committee shall consider all scientific questions and data pertaining to engineering codes and standards, initiate, and propose changes and improvements thereof for the public benefit, and report its recommendations to the Council.

It was moved by Mr. Hunter, seconded and voted unanimously that the resolution be adopted and the proposed amendments be submitted to Society vote at the Annual Meeting of 1954.

President Taylor introduced John W. James as chairman of the first Technical Session.

After reading the rules for professional sessions Mr. James called on Prof. B. H. Spurlock, Jr., who presented an abstract of his paper, Performance of a Forced Draft Cooling Tower (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1953, p. 115).

Discussions were offered by L. T. Mart, Kansas City, Mo., F. J. Nunlist, Jr., Milwaukee, Wis., W. F. Friend, New York, N. Y., H. E. Ziel, Detroit, Mich., W. A. Danielson, Raleigh, Tenn. and G. W. Hummel, Phoenix, Ariz.

The second technical paper, Effect of Relative Humidity On Heat Loss

Ways and Means Committee — (*l. to r.*) A. V. Hutchinson, I. W. Cotton, E. R. Queer, M. K. Fahnestock, L. T. Mart, R. S. Dill, N. H. Peterson

Guide Committee members meet in Chicago — C. D. Shields, R. E. Cherne, W. S. Harris, Carl H. Flink, P. R. Achenbach

of Men Exposed to Environments of 80, 76 and 72F, by Tohru Inouye, F. K. Hick, M. D., S. E. Telser, M. D., and R. W. Keeton, M. D., was presented in abstract by Mr. Inouye (see p. 109).

A discussion of the paper by Dr. L. P. Herrington, New Haven, Conn. and other discussions were given by M. K. Fahnestock, Urbana, Ill., F. H. Faust, Bloomfield, N. J., P. J. Marschall, Chicago, Ill., J. D. Kroeker, Portland, Ore., W. A. Grant, Syracuse, N. Y., G. W. Hummel, Phoenix, Ariz., C. B. Gamble, New Orleans, La., and P. B. Gordon, New York, N. Y.

The third technical paper, Experimental Approaches to the Study of Noise and Noise Transmission in Piping Systems, by W. L. Rogers was presented in abstract by the author (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1953, p. 139).

E. L. WEBER, Seattle, Wash. (WRITTEN): There is a growing need for the extensive study of noise elimination in buildings. Great strides have been made by the acoustical treatment industry, but there has been a woeful lack of progress in the heating and ventilating industry. Only in recent years has the noise level of fans been inserted in catalogs.

The noise produced by liquids in pipes and fittings requires much study. The use of pipe bends and welded connections has done much to improve the situation, but valves are still noise producers.

In my experience with large hot-water heating systems, I have found that less noise is produced by using velocities of 10 to 12 fps, than is produced by increasing the size of the mains and throttling down the flow with a valve to give the same delivery of water at a lower velocity. The valve increases the noise level. The velocity of the liquid does not seem to have much effect on the noise level, but the turbulence set up by the valves has considerable effect.

The same thing applies to the movement of air, it is not the velocity, but the turbulence set up by improperly designed duct systems and especially by the uneven distribution over the fan discharge that produces noise. This requires study and correction by the fan manufacturers.

The valve manufacturers should also endeavor to produce valves, possibly designed on a venturi-tube principle, to eliminate turbulence and its ensuing noise.

All set for the Good-Time Party — Dorothy Mildner, Mrs. D. B. Anderson, Mrs. Elmer Queer, Mrs. Reg. F. Taylor, with J. S. Locke, D. B. Anderson and Fred Janssen in rear

A flush valve and flush tank without the usual hissing just before closing would be a godsend to the industry.

The use of lead to eliminate transmitted noises opens a wide field for noise level reduction, as the velocity of sound through lead is only one-fourth that through iron or steel. Lead has practically no resilience and hence will dampen vibrations.

The laboratory at Evanston can undoubtedly be of great value to the industry, and should deserve the utmost support of the Society.

R. T. KERN, Fitchburg, Mass. (WRITTEN): This paper starts a study of problems, the answers to which have been needed for a long time by those actively interested in designing hot water heating systems. Although little of practical value has as yet been developed, it is interesting to note that methods of procedure have been developed and now quantitative studies can be started.

There is a great deal of work to be done before practical answers can be expected, but since the noise developed in straight pipe seems to be of very minor importance, it would seem the first studies should be made to find the major causes of noise and the methods that can be used to eliminate them. From personal experience, I feel the major causes of noise are throttling valves and orifices, either or both of which are required on practically all hot water systems larger than residence size.

In practically all large systems, a certain amount of noise is acceptable but the high pitched noise caused by a throttling valve used to decrease the pressure on the down stream side a considerable amount so as to equalize the friction loss of various circuits, cannot be tolerated. Up to now, the only practical way to reduce this noise is to use multiple throttling valves in series. The number of valves required is almost entirely a guess and the lowest noise level is found by trial and error.

Orifice plates have their limitations also, since they have fixed outlet sizes and the drop through them cannot be changed without removal or change of size, so it would appear we must depend on valves to secure the necessary control. The study of methods that can be used to eliminate the noise they generate should be of prime importance in order to find the *most needed* answer to the problem.

With the water velocities normally used in heating systems it is my belief that noise generated by fittings of various types is of such low intensity as to be practically negligible.

The use of flexible hose of any kind is usually impracticable.

I hope the Society will continue this very worthwhile project until we have the information so urgently needed.

A. T. JONES, Toronto, Can. (WRIT-

Semi-Annual Banquet in the Shirley-Savoy's Lincoln Room, Denver, July 1, 1953

Indian Ceremonial Dance by Boy Scouts

Chow line at Elk Falls Ranch

TEN): This paper is particularly valuable as an introduction to the work being carried out at Northwestern University. It will give the reader a useful reference when studying succeeding papers based on this research when for lack of space, it will be impossible to include a description of the test method.

It is generally considered that velocities in hot water heating pipe lines should not exceed 4 fps for relatively quiet operation, while some authorities specify 300 milinches per foot friction loss as being good practice with a maximum of 400 milinches per foot. This latter assumption indicates that larger pipes will carry higher velocities than the smaller pipes for relatively quiet operation—for example 400 milinches per foot friction in a ¾ in. pipe corresponds to 2 fps velocity, while a 4 in. pipe at same resistance per foot has a velocity of 6 fps. It is to be hoped that the final results of this research will solve this problem.

The work to date seems to indicate that velocities as high as 10 or 12 fps might be carried in straight pipe of 1 in. size. However, valves and fittings are the trouble makers preventing the use of such velocities in hot water heating systems for residential or office heating. Would it be too fantastic to suggest that our whole design of valves and fittings might be greatly influenced by this research?

Screwed valves and fittings might be streamlined to the point where much higher velocities could be satisfactorily employed than at present. The expansion and contraction of the flow when entering or leaving fittings (due to excess of fitting inside diameter over pipe diameter) might even be a source of noise.

In possible quieting schemes the fact that a given valve or fitting has a relatively high magnitude at certain frequencies should be kept in mind.

It is possible that most sounds due to velocity fall in a certain range of frequency where a useful quieting scheme might be employed to eliminate the most bothersome component.

In reading this paper three main considerations came to mind, no doubt later work will help provide answers to these questions which follow:

1. How can noise be reduced to an acceptable level when found in existing systems?
2. What precautions should be taken to design systems for quiet operation using present day fittings?
3. How can we make use of higher velocities than presently employed while still keeping noise to an acceptable level?

Additional discussions were presented by M. W. McRae, Chicago, Ill., and R. C. Chewning, Portland, Ore.

At the conclusion of the technical session Mr. James thanked the authors and discussers and turned the meeting over to Pres. Reg. F. Taylor who adjourned the meeting at 12:10 p.m.

SECOND SESSION, TUESDAY, JUNE 30, 9:30 A.M.

Pres. Reg. F. Taylor called the meeting to order in the Lincoln Room of the Shirley-Savoy Hotel at 9:30 a.m. and introduced W. F. Friend as chairman of the technical session.

Mr. Friend called on Prof. Carl F. Kayan who gave an abstract of his paper, Electric Analogger Application to the Heat Pump Process (see p. 123).

Extracts of discussions of the paper by E. R. Ambrose, New York, N. Y. and Mr. Friend are included with the paper.

The second technical paper Design and Performance of a Residential Earth Heat Pump, by Merl Baker was presented in abstract by Dr. Y. S. Touloukian, West Lafayette, Ind. (to be published in ASHVE JOURNAL SECTION, *Heating, Piping, & Air Conditioning*).

Discussions by J. D. Kroeker, Portland, Ore., G. O. G. Lof, Denver, Colo., R. C. Chewning, Portland, Ore., G. W. Hummel, Phoenix, Ariz., S. S. Sanford, Detroit, Mich., M. K. Fahnestock, Urbana, Ill., D. L. Mills, Rome, N. Y. and a closure by Dr. Touloukian will be published with the paper.

Mr. Friend called on Dr. Raymond Eisenstadt to present an abstract of the paper, Moisture Movement in Soils Due to Temperature Difference, by W. A. Hadley and Raymond Eisenstadt (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1953, p. 111).

Dr. R. S. Touloukian, West Lafayette, Ind., suggested that the authors should include references to work of other authors who had investigated similar methods for determining moisture transfer.

Dr. Eisenstadt stated that a large number of references to previous investigations by others were given in his complete thesis covering the work on which the paper was based.

At the close of the technical session Mr. Friend thanked the authors and discussers and turned the meeting over to President Taylor who adjourned the meeting at 12 noon.

THIRD SESSION, WEDNESDAY JULY 1, 9:30 A.M.

Pres. Reg. F. Taylor called the meeting to order at 9:30 a.m. in the Lincoln Room of the Shirley-Savoy Hotel and introduced Prof. E. R. Queer as chairman of the technical session.

Prof. Queer called on R. A. Miller,

Pittsburgh, Pa., to present an abstract of the paper, Design Data for Slat-Type Sun Shades for Use in Load Estimating, by G. V. Parmelee and D. J. Vild (to be published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September, 1953).

Written discussions were given by R. W. McKinley, Pittsburgh, Pa., and E. W. Conover, Detroit, Mich. These discussions together with extracts of discussions by C. M. Humphreys, Cleveland, O., and W. A. Danielson, Raleigh, Tenn., will be published with the paper.

The second technical paper, Automatic Permeance Testing by the Permeometer, by F. A. Joy and A. W. Sherdon was presented in abstract by Mr. Sherdon (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1953, p. 125).

Professor Queer called on G. O. Handegord to present an abstract of the third technical paper, Thermal Performance of Frame Walls, Part II — Air Spaces Blocked at Mid-Height, by G. O. Handegord and N. B. Hutcheon (see p. 117).

Discussions were given by Professor Queer, R. K. Thulman, Wash. D. C., D. L. Mills, Rome, N. Y., G. L. Tuve, Cleveland, O., W. A. Danielson, Raleigh, Tenn., W. O. Huebner, New York, N. Y. and D. B. Anderson, St. Paul, Minn.

The fourth technical paper, Development of the Thermal Conductivity Probe, by F. C. Hooper and S. C. Chang, (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1952), was presented by title.

Visitors from New York — Mr. & Mrs. J. W. Kreuttner, D. C. Lindsay, H. S. Dutcher

The session was adjourned at 11:40 a.m.

FOURTH SESSION, WEDNESDAY, JULY 1, 1:30 P.M.

Pres. Reg. F. Taylor called the meeting to order in the Empire Room of the Shirley-Savoy Hotel at 1:30 p.m. and presented First Vice-Pres. L. N. Hunter as chairman of the technical session.

Mr. Hunter called on F. J. Nunlist, Jr. to present an abstract of the paper, Performance of Warm Air Perimeter Loop and Perimeter — Radial Systems in a Residence, by H. T. Gilkey, R. W. Roose and M. E. Childs (to be published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*).

Written discussions by C. M. toe Laer, Bloomfield, N. J., and W. M. Myler, Columbus, O., were read by F. H. Faust and C. H. Flink. These discussions together with extracts of verbal discussions by R. K. Thulman, Washington, D. C., R. S. Dill, Washington, D. C., D. L. Oslund, Minneapolis, Minn., J. L. Antonio, Denver, Colo., W. W. Greiling, Cleveland, Ohio, and P. W. Young, Denver, Colo., will be published with the paper.

The second technical paper, Heat Exchanges in a Floor Panel Heated Room, by L. F. Schutrum, C. M. Humphreys and G. V. Parmelee (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1953, p. 133), was presented in abstract by Mr. Schutrum.

Discussions of the paper were offered by P. B. Gordon, New York, N. Y., A. B. Algren, Minneapolis, Minn., W. A. Danielson, Raleigh, Tenn., C. G. Newton, Chicago, Ill.

Mr. Hunter called on C. M. Humphreys to present the third technical paper, Further Studies of Thermal Characteristics of Plaster Panels, by L. F. Schutrum and C. M. Humphreys (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1953, p. 122).

Dinner served buffet style at the "Good-Time Party" on Monday night in Denver

Evidence of the "Good-Time Party" in Denver (brought back memories of Gold Rush Days) with Art Gow's orchestra playing Western music.

Dressed for the Gold Rush — Mr. & Mrs. R. H. Hillbrand, Elmo Hall, B. H. Spurlock, Jr., E. A. Thompson, Mrs. W. J. McDonald

Elk Falls Ranch — A. V. Hutchinson, Mr. & Mrs. G. A. Linskie, Pres. & Mrs. Reg. F. Taylor

CARL F. KAYAN, New York, N.Y. (WRITTEN): Continued progress in the understanding of panel performance is again evidenced by this contribution from the Research Laboratory. Particularly important are the conclusions at the end of the paper, especially items 4 and 5.

The thermal behavior of these panels is directly concerned with the communication of the tube temperature to the panel surface, in which metal lath, plus plaster, and their *contact* with the tube are most important. The contact element at the tube seems to have the most outstanding effect, hence here we might expect that the quality of a job would depend on the effectiveness of such tube contact. Back plastering and good tube embedment, plus metallic contact by means of wiring, would seem to be most essential, to the extent that perhaps wiring spacing closer than 8 in. might be desirable.

It would also have been interesting if back-plastering had been applied to the No. 5 panel, rather than just to the No. 6 panel, especially since Table 1 indicates the startling information that the No. 6 panel tube embedment was considered poor.

The inclusion of the examples of computation in the paper has been most helpful in interpretation and the utilization of the results.

E. R. SARTAIN, Urbana, Ill. (WRITTEN): In the conclusions it is stated that the effect of insulation on the back of plaster panels serves the following purposes: (a) reduces upward heat flow; (b) increases the average panel surface temperature for a given tube temperature; or conversely, (c) for a given downward heat flow, permits operation with a lower tube temperature than would be required if the panel were not insulated. These conclusions seem logical and would be expected under normal operation, but according to Figs. 5 and 6 insulation has no effect on the surface temperature wave amplitude in the tests when compared on the basis of total panel output.

What could be expected in the variation of surface temperature wave amplitude when plotted against the ratio of upward to downward heat flow, or when plotted against downward heat flow rather than total heat flow for the cases including insulation, and without insulation? In other words, under normal conditions of operation (in the field) it would seem logical that the effect of the insulation on the reverse side of the panel would tend to increase the mean panel surface temperature for a given tube temperature, thereby causing a larger heat flow downward with insulation than without at the same tube temperature.

From the work of Hulbert, Nottage, and Franks, reported in their paper Heat Flow Analysis in Panel Heating or Cooling Sections (ASHVE TRANSACTIONS, Vol. 56, 1950, p. 189), the theory developed indicates that the heat flow through a panel is made up of two components: source heat flow + linear heat flow. By keeping the source heat flow constant and increasing the linear heat flow, the total output would be increased. It seems that the use of insulation on the reverse side of the panel would cause an increase in temperature on the reverse surface thereby increasing the linear component of heat flow for the same tube temperature. This downward heat flow is also a function of the absorber temperature because of the effect of the absorber temperature on the panel surface temperature. For this reason, I would be interested in knowing what the range of absorber temperatures was during the tests.

These remarks are made in the interest of relating the many variables in the entire panel heating system to the performance of the panel; *i.e.*, environmental conditions, reverse insulation, tube temperature, etc. Also, the relationship between the theory developed in the previously mentioned paper and the test results presented here are not clear in my mind. I wonder whether the theory of heat flow developed for concrete floor panels can be applied to ceiling panels since the embedding of the tubes is an additional variable to be considered.

Arthur Nutting, Judy Blankin and W. M. Wallace, II

Further discussions of the paper were given by D. L. Mills, Rome, N. Y., R. L. Maher, Waterbury, Conn., W. M. Wallace II, Durham, N. C., P. B. Gordon, New York, N. Y., L. A. Burch, Detroit, Mich., and E. L. Weber, Seattle, Wash.

Mr. Hunter announced that the fourth technical paper, Heat Flow Analysis in Panel Heating or Cooling Sections — Case II: Floor Slab on Earth with Uniformly Spaced Pipes at Slab-Earth Interface, by H. B. Nottage, C. V. Franks, L. E. Hulbert and L. F. Schutrum (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, May 1953, p. 115) would be presented by title.

At the close of the Technical session the Meeting was turned over to Pres. Reg. F. Taylor who called for the report of the Committee on Resolutions which was presented by William J. Collins, Jr.

RESOLUTIONS

WHEREAS, the ASHVE Semi-Annual Meeting 1953 in the mile high city of Denver, is coming to a conclusion; and

WHEREAS, the Rocky Mountain Chapter, through its excellent Committee on Arrangements has made this an outstanding, not to say elevating event; and

WHEREAS, the ladies of the Host Chapter have so generously given of their time and efforts to please the members' wives and children; and

WHEREAS, President Reg. F. Taylor and the Sessions Chairmen have conducted all meetings in an exemplary manner so that time was given for social enjoyment and renewal of friendships, and

WHEREAS, the Management and Staff of our headquarters hotel, the Shirley-Savoy and cooperating hotels have been so thoughtful of our every need and comfort, and

WHEREAS, the City of Denver has singularly honored our President, Reg. F. Taylor,

THEREFORE, BE IT RESOLVED,

THAT we, the members of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS here assembled in Cool (?) Colorful Colorado, give due recognition:

To the men and women of the Rocky Mountain Chapter, to the various Committee members and to Chairman Fred Janssen and Vice Chairman E. A. Thompson, and

To the City of Denver, the Denver Convention and Visitors Bureau, and

To the trade press and local newspapers for their excellent coverage of our Meeting,

To the Medicine Pipe Indian Dancers for their splendid entertainment at Elk Falls Dude Ranch,

And, we extend to all our heartfelt thanks for a wonderful and varied program of events purposely planned for our pleasure, and further,

We express our appreciation to those contributing papers and discussions at our technical sessions, and

To Judge Benjamin C. Hilliard for his welcoming address, and

To Toastmaster Judge Wilson McCarthy, and

To Under Secretary Walter Williams for his consideration in addressing our Banquet, and

To the Shirley-Savoy Hotel and to Pres. Reg. F. Taylor, his officers and committees for another successful meeting.

Respectfully submitted,

M. W. BISHOP, *Chairman*
WM. J. COLLINS, JR.
F. H. FAUST

It was moved by W. A. Danielson, seconded and voted unanimously that the report of the committee be approved and included in the record of the Semi-Annual Meeting.

President Taylor announced that the final registration was 618 members and guests, thereby establishing a new record for Semi-Annual Meetings. He congratulated the Rocky Mountain Chapter on the great success of the Meeting.

After extending a cordial invitation to all to attend the next Annual Meeting in his home city of Houston, Tex., President Taylor declared the meeting adjourned at 4:10 p.m.

Fred Janssen, Denver, and W. M. Wallace, II, Durham, N.C., furnished the pictures appearing throughout the Denver Meeting pages.

Entertainment Tops in Denver

ENTERTAINMENT PLANS carefully made by the Rocky Mountain Chapter kept ASHVE members and guests busy from Saturday, June 27 until the close of the Semi-Annual Meeting at the Banquet on Wednesday evening. The committees which were ready with plans for all entertainment features were: *Entertainment*, J. R. Wilson, chairman; *Ladies*, Mr. & Mrs. H. H. Herman, chairmen; *Reception*, K. H. Smith, chairman; *Sports*, Elmo Hall, chairman; and *Transportation and Special Events*, J. H. McCabe, chairman.

From the registration headquarters members and guests always seemed to be taking buses for some point of interest or to be just returning from an interesting trip. The Transportation Committee was especially busy but seemed, nevertheless, to have cars or buses ready for any number of guests desiring to inspect local or distant scenery. The meeting place was a mile high but very few failed to reach the tops of mountains of 9,000 to 14,000 ft to enjoy new views of the rugged scenery and to make picture records for future enjoyment.

On Sunday evening, Prof. and Mrs. B. H. Spurlock, Jr. entertained the Council and guests at a picnic supper on Mt. Flagstaff, 2000 ft above Boulder, Colo. The city of Boulder, with its adjoining rich farm lands up to 20 miles away, supplied by irrigation water from the mountains made a delightful picture from the top of the mountain.

The welcome luncheon in the Shirley-Savoy Hotel on June 29 was attended by 225 members and guests. Dale Mathes of the Mayor's Greeter's Committee presented Pres. Reg. F. Taylor with a Denver Silver Dollar and Hon. Benjamin C. Hilliard spoke informally of the wonders of cool, colorful Colorado.

While Technical Advisory, Standards, Program and Papers, and other Committees discussed matters of Society interest, 50 of the Society's best and worst golfers competed for the Research, Eichberg Memorial, and Paul Bunyan Cups at the Lakewood Country Club.

R. D. Ireland of the Michigan Chapter, with the low net score, won the Research Cup. The Eichberg Memorial Cup was won for the Illinois Chapter by J. S. Kearney, H. G. Chapin, and G. W. Bornquist. R. T. Beck of the Rocky Mountain Chapter won the Paul Bunyan Cup with high gross. The low score on No. 11 hole was won by Arthur Nutting, Louisville, Ky. Mr. Kearney had the most sixes (10).

The Ladies Style Show and Tea at the Park Lane Hotel was enjoyed by 200 guests. Gay Nineties' costumes were modeled by some ladies from nearby Englewood, Colo.

At the Good Time Party on Monday night a delicious buffet supper was served to a crowd of 361. Costumes worn were reminders of cowboys, prospectors and highwaymen. Souvenir scarfs and samples of gold and silver ore were given to all guests. Sleight-of-hand artists and photographers mingled with the guests at various tables to entertain and to give away photographs. The

"Coketail" Party — Dean Park, Caroline Old, Diana Park, Carol Burch, Sally Boales, Tom Haines. *Rear:* Betty Evans, Patsy Hunter, Mrs. Bruce Evans, J. E. Haines

Colorado Ramblers, a cowboy style band, provided music during the supper and for square dancing which followed. A second orchestra arrived at 10 o'clock to play for dancing until 12:30 a.m.

Fifty-five ladies attended the matinee performance of the opera *Carmen* at the Central City Opera House on Tuesday afternoon, after which they joined the party at the Elk Falls Ranch for the Chuckwagon Barbecue.

On Tuesday afternoon eight buses started at various times from 12:15 p.m. to 1:30 p.m. to enable the sightseers to make a tour through the mountain country on the way to the Elk Falls Ranch. Those who made the longest trip reached the Berthoud Pass on the Continental Divide at an elevation of 11,314 ft. Many of the passengers rode the ski chair lift to an elevation of 12,000 ft. All of the buses arrived at Elk Falls Ranch at 6:00 p.m. where a Chuckwagon Barbecue Supper was served to the crowd of 403 adults and 30 children. After supper a Boy Scout group entertained the members and guests with authentic Indian Dances in full Indian dress.

On Wednesday afternoon 70 ladies attended a matinee performance at the Elitch Gardens Summer Theater.

Special attention was given at all times during the meeting to provide enjoyment for the teen-agers and younger children. This entertainment included an airplane ride over the city of Denver, visits to the city park and zoo, a swimming party given by Mr. and Mrs. H. H. Herman and visits to the Elitch Gardens featuring rides, amusements and dancing.

The Semi-Annual Banquet was held on Wednesday evening with an attendance of 329. Judge Wilson McCarthy, president of the Denver and Rio Grande Western Railroad Co., was the toastmaster and Walter Williams, Under Secretary of Commerce, was the principal speaker. Mr. Williams referred to the heavy responsibilities which will be carried by engineers during the next decade due to the fact that new engineering graduates have dropped from a peak of 52,000 in 1950 to about 19,000 in 1954. Referring to the possibility of peace and its effect on the national economy, Mr. Williams pointed out that if defense expenditures were reduced by 20 billion dollars this reduction could be offset by the production required by a 10 percent rise in living standards. The speaker complimented the Society on its foresight in maintaining a research laboratory which was contributing information leading to the solution of so many problems relating to heating, ventilating and air conditioning.

A large part of Mr. Williams' speech was devoted to the efforts being made to effect substantial economies in the various Government departments, particularly the Department of Commerce. He outlined many of the difficulties faced by the executives in the various departments in maintaining the important services such as those provided by the Weather Bureau and the National Bureau of Standards while, at the same time, reducing the cost of operation.

Mr. Williams stated that a streamlined organization is being set up in the Commerce Department consisting of 20 industry divisions which are planned for such areas as iron and steel, chemicals, forest products, and consumer durable goods. These divisions will have key advisors from industry and will be staffed for operations by experts in the career service. They will serve as a central point of contact for business in government and provide a means by which business can make its views known before and while governmental policies are being discussed and formulated for peace or for emergencies. In addition, these divisions will continue to see that production needs for defense and atomic energy projects will be met, will secure cooperation of industries in mobilization base and post attack programs, and keep up-to-date organization plans for crises which might develop. One of the units in this new business service set-up will deal with construction and building materials. Accordingly, in connection with the new unit, steps are being taken for the restoration of a more adequate national data series on construction activity; regional and state estimates for major types of construction will be resumed and the index for construction materials and the index of composite construction costs will be improved.

As special features at the Banquet, Pres. Reg. F. Taylor presented a Memory Book to Past President Lauren E. Seeley. Dean Seeley in turn presented a Memory Book to Past President Ernest Szekely. These books contain photographs, publicity items, and miscellaneous mementos of the year in which each recipient was President of the Society.

Following the Banquet the entertainment for the remainder of the evening was presented by Art Gow's orchestra which played for dancing until midnight.

Honored by Life Membership

EARL J. GOSSETT — President and Chairman of the Board, Bell & Gossett Co., Morton Grove, Ill. Mr. Gossett became a Life Member after 30 years membership in the Society.

Born in Norris City, Ill., Mr. Gossett studied mechanical engineering at the University of Illinois, and metallurgy at Lewis Institute which is now a part of the Illinois Institute

E. J. Gossett
Morton Grove, Ill.

of Technology. He started work in 1909 as a draftsman for D. H. Burnham Co., Chicago, Ill. After two years of drafting, he entered the sales engineering field, specializing in steam, water, air, and gas. In 1916, together with Wakeman C. Bell, he started the firm of Bell & Gossett Co. In addition to being the active head of this organization, Mr. Gossett is also a director of the following: U. S. Radiator Corp., Detroit, Mich.; Kiowa Corp., Marshalltown, Ia.; La Salle National Bank, Chicago, Ill. and Harris Metals Treating Co., Racine, Wis.

HOWARD C. MURPHY — Consulting Engineer, Carmel, Calif. Considered one of the pioneers in the commercial development and application of the viscous impingement type of air filters, Mr. Murphy entered this field in 1921 with the formation of the Mid-West Steel and Supply Co., New York. In 1922 he was vice president of the Reed Air Filter Co., Louisville, Ky., a position he held with it and its successor, The American Air Filter Co., until 1947. In that year Mr. Murphy moved to California, specializing as a consultant in air purification work.

Born in 1887 in Newport, R. I., Mr. Murphy received his education in public schools in Newport, R. I., and Springfield, Mass., and at Georgetown University, Washington, D.C. From 1915-18 he was chief draftsman at Remington Arms Co., Philadelphia, Pa. He left Remington to join the Naval Flying Corps and from 1920 to the present time he has been concerned with the development and application of procedures

H. C. Murphy
Carmel, Calif.

for eliminating various forms of air pollution.

A member of the Society since 1923, Mr. Murphy has served on many Society committees. He is a registered professional engineer in California, and a member of the *ASME, National Fire Protection Association,* and *Society of American Military Engineers.*

H. LEIGH WHITELAW — Managing Director, *Gas Appliance Manufacturers Association,* New York, N.Y. Mr. Whitelaw's first connection with the boiler and radiator field, on which he is an authority, commenced at the St. Louis plant of the American Radiator Co. in 1903. In the ensuing years, he trained as a production man in various plants until 1913 when he became manager of the Smokeless Boiler Department, American Radiator Co., Chicago, Ill.

During the first World War Mr. Whitelaw was an administrative officer of the Royal Corps and the Royal Air Force. He has also served as vice president of the Williams Radiator Co., St. Louis, Mo., and as an executive vice president of the American Gas Products Corp.

Born in Toronto, Ont., Canada in 1888, Mr. Whitelaw is a member of

H. L. Whitelaw
New York, N.Y.

numerous associations including the following: National Panel of the *American Arbitration Association; American Petroleum Institute,* Gild of Ancient Supplers; *National Industrial Council; Society of Gas Lighting; Society of Business Advisory Professions; Canadian Society of New York;* English Speaking Union; *Trade Association Executives* (N. Y. and national) and secretary of the National Committee for Fair Emergency Excise Taxation, 1950-51.

C. W. FARRAR JOINS CASE

Effective July 1, C. W. Farrar will be located in Buffalo as administrative officer of promotional sales for W. A. Case & Son Mfg. Co. He was previously associated with this firm in 1939. Prior to his new appointment, Mr. Farrar was vice president and general manager of sales, Richmond Radiator Co., New York, N.Y. A member of the Society since 1918, he served on Council and as Treasurer in 1930 and has always maintained an active interest in the Western New York Chapter.

Summary of Chapter Meetings*

• *BALTIMORE:* The May meeting was presided over by Pres. E. R. Kent at the Engineers Club. He announced the election of the following officers for 1953-54: *President* — H. D. Glaser; *Vice President* — E. H. Taze; *Treasurer* — R. W. Pentecost; *Secretary* — G. J. Senner; *Board of Governors*: E. R. Kent, E. S. Berngartt, and R. T. Bollman.

The speaker of the evening, G. L. Simpson, vice president and general manager, Pittsburgh Lectrodryer Corp., Pittsburgh, Pa., was introduced by E. S. Berngartt. Mr. Simpson's subject was *The Ocean of Air* which he illustrated by the use of slides. Attendance 40. Attendance ratio 0.37.

• *DELTA:* Pres. Walter Cooke called the May meeting to order in the Trophy Room of the New Orleans Athletic Club. After thanking the various committee chairmen and members for their cooperation during the year, he appointed R. B. Guest as teller of elections. The new officers elected for 1953-54 are as follows: *President* — H. L. Salaun; *Vice President* — C. V. Bankston; *Treasurer* — J. J. Friedler, Jr.; *Secretary* — T. J. Jenny; *Board of Governors*: L. R. Maxwell and H. N. Stall.

President Salaun then presented Retiring President Cooke with an engraved pen and pencil set as a token of appreciation of his service to the Chapter.

Mr. Maxwell introduced the guest speaker, Dr. Paul De Camp, who gave a very interesting talk on surgical operations performed on the human heart.

• *GOLDEN GATE:* The June meeting was called to order by Pres. T. J. White at the Engineers Club. After various committee chairmen gave their reports, the new officers for 1953-54 were announced as follows: *President* — J. E. Murray; *Vice President* — Eric Roberts; *Secretary* — D. E. McLeod; *Treasurer* — F. K. Crouch; *Board of Governors*: H. L. Duncan and E. F. Dill.

Retiring President White then gave the gavel and Charter to newly elected President Murray. Mr. Murray's first official act as president was to call upon R. C. Cushing to present a past president's pin to Mr. White. With the assistance of H. A. Wolfson, President Murray presented some tape recordings from the *Air Conditioning Conference* which was sponsored by the Oregon Chapter. The meeting terminated with a color film on Denver. Attendance 58.

• *ILLINOIS:* The Illinois Chapter held their annual dinner dance and Society's President's Night Meeting at the Lake Shore Club in Chicago with Pres. and Mrs. Reg. F. Taylor as honored guests. M. W. Bishop, president of the Chapter, introduced President Taylor who delivered a most interesting talk to the members and their wives.

Sec'y. G. V. Zintel read the results of the election of officers as follows: *President*—H. G. Chapin; *Vice President* — G. V. Zintel; *Treasurer* — G. G. Freyder; *Secretary* — H. G. Gragg; *Board of Governors*: J. F. Cummiskey, Herbert Kreisman, and C. R. Kuglin.

The gavel was then presented to newly elected President Chapin who bestowed a past president's pin upon Retiring President Bishop.

• *INDIANA:* The May meeting was called to order by Pres. J. T. Hardin at the Construction League Building. He introduced the two guest speakers; Billy DeVore, racing car driver, and Keith Bratton, Stark Wetsel Co., who showed two films, one dealing with the 500-mile race held in 1911 and the other with the 1952 race. The presentation of these films illustrated the advancement of automotive engineering during that 41-year period. A lively discussion period followed.

After several committee chairmen presented their reports, the following officers were elected for the new season: *President* — R. C. Blackman; *Vice President* — P. O. Patterson; *Secretary* — J. W. Jackson; *Treasurer* — A. O. Roche, Jr.; *Board of Governors*: W. W. Grear, F. B. Morse, and J. T. Hardin.

Retiring President Hardin turned the meeting over to newly elected President Blackman who appointed a nominating committee with C. F. A. Locke as chairman, assisted by Alfred Pfau, R. G. James, and W. R. Fenstermaker, Jr. Attendance 52.

• *KANSAS CITY:* The May meeting was called to order by Pres. W. A. Reichow at the Wishbone Restaurant. After several chairmen presented their reports, the new officers for 1953-54 were announced as follows: *President* — G. H. Stoffer; *Vice President* — F. K. Ladewig; *Secretary* — A. S. Hurt, Jr.; *Treasurer* — R. M. Spencer; *Board of Governors*: W. A. Reichow, H. A. Atwater, and H. H. Lewis.

The gavel was then turned over to newly elected President Stoffer, who bestowed a past president's pin upon Retiring President Reichow. Guest speaker C. W. Nessell, account executive, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., gave a most interesting talk on *Perimeter Heating and Air Conditioning*. A lively discussion period followed. Attendance 86. Attendance ratio 0.29.

• *MANITOBA:* The May meeting included a golf tournament and a ladies' party held at the Pine Ridge Golf Club.

Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

The following slate of officers was elected for the coming season: *President* — A. K. Piercy; *Vice President* — J. A. Bell; *Secretary-Treasurer* — D. B. Brace; *Board of Governors*: W. J. Atkinson, J. F. Bertram, Ernest Lambert, J. C. Stangl, H. F. Randall, A. J. McIntyre, G. E. Dahlgren, and G. T. Christie.

Newly elected President Piercy spoke on his plans for the new season and solicited the cooperation of the incoming vice president and secretary-treasurer. Attendance 42. Attendance ratio 0.57.

Northern Piedmont Chapter Officers — (*l. to r.*) S. T. Oliver, secretary, J. E. Hart, president; L. R. Gorrell, vice president

• *MEMPHIS:* The June meeting was called to order by Pres. A. W. Shelby at the King Cotton Hotel. President Shelby announced that this was the last meeting until September, except for the Picnic to be held August 1 at the Ira Lichterman place.

W. L. Henson and E. A. Smith were unanimously elected as members of the Board of Governors.

H. H. Wilson introduced the guest speaker, Neil Sellman, Southeastern refrigeration manager, Servel Corp., whose subject was *Absorption System of Refrigeration.* His talk was well illustrated with color slides. An interesting question and answer period followed. Attendance 22.

• *NORTH JERSEY:* The June meeting was held at the Essex Country Club in West Orange, N. J. Members and guests participated in golf and other sports during the day, while the evening was reserved for dinner and entertainment. The highlight of the evening was a very interesting presentation on *The Romance of the Music Boxes* by the Browns of Chatham, N. J. They presented the history of mechanized music as it developed in the 19th Century. The members were then invited to examine the numerous music boxes on display. Attendance 98.

• *NORTH JERSEY:* The May meeting was called to order by Pres. F. H. Faust who announced that this would be the final business meeting of the season. He declared that the next meeting would be held on the second Tuesday in October. However, the Board of Governors will meet in the interim to transact any important business which may be necessary for next year's programs.

H. M. Patrick, chairman of the program committee, reported on the plans for the June social meeting. He then introduced the guest speaker, H. N. Crowell, Therm-O-wheel Co., Inc., New York, N. Y., whose subject was *Heat Regenerator.* Mr. Crowell explained that the regenerator was designed to recover the heat of exhaust air in ventilating systems and to transfer heat to the air being exhausted in air conditioning systems. An interesting question and answer period followed. Attendance 70.

• *NORTHEASTERN OKLAHOMA:* Guest speaker A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, Calif., spoke on *High Temperature Hot Water Heating.* He described the advantages in using this medium and also outlined some of the problems. A lively question and answer period followed.

Pres. J. N. Watt, who presided at the May meeting, announced the plans for the June meeting and also stated that there would be no meeting in either July or August. Attendance 25. Attendance ratio 0.61.

• *NORTHEASTERN OKLAHOMA:* The April meeting was called to order by Pres. J. N. Watt in the Student Activities Building at the University of Tulsa. The secretary introduced members and guests and read the minutes of the previous meeting. The business meeting adjourned and the entire group went on a tour of the Tulsa Power Plant of the Public Service Co. of Oklahoma. The tour was conducted by J. D. Shaw of the Northeastern Oklahoma Chapter. Attendance 21. Attendance ratio 0.46.

• *NORTHERN OHIO:* The May meeting was called to order by Pres. R. E. Sherman at the Allerton Hotel. He then announced that the Chapter was informed that J. C. Hobbs was elected to Life Membership in the Society.

D. E. Mannen was elected as Member and L. C. Burkes as Alternate Member on the Chapters Conference Committee. J. E. Wilhelm reported that there will be a public hearing on recent rulings concerning heating standards in the State's New Building Code.

ASHVE Past President Lester T. Avery introduced the guest speaker, W. T. Van Orman, research engineer, The Goodyear Tire & Rubber Co., Akron, Ohio, who spoke on *The New Approach to Air Cleaning.* Mr. Van Orman described self-charging polyethylene filters and compared their performance with other types of filters. His talk was very well illustrated with slides, tables and graphs.

An interesting question and answer period followed. Attendance 83.

• *OTTAWA VALLEY*: The May meeting was called to order by Pres. Bernard Stotesbury at the Prescott Hotel after which he presented the gavel to the incoming president, G. L. Ostiguy. Then President Ostiguy presented a silver tray to Retiring President Stotesbury.

This was followed by an open discussion on *The Merits of Warm Air Compared with Steam and Hot Water*. S. J. Bullis upheld warm air, C. W. Watson was for steam, and D. D. Tammey spoke for hot water. A spirited discussion period terminated the evening. Attendance 24.

• *SACRAMENTO VALLEY*: The June meeting was held at the Coral Reef and was called to order by Pres. L. A. O'Meara. After several committee chairmen presented their reports, the newly elected officers were announced as follows: *President* — E. C. McKinsey; *Vice President* — J. E. Marshall; *Secretary* — R. A. Sarro; *Treasurer* — V. W. Thornburg; *Board of Governors*: L. A. O'Meara, N. W. Downes, and J. E. Day.

Retiring President O'Meara presented the gavel and Charter to Mr. McKinsey, the incoming president, who introduced the guest speaker, J. J. Grant, mechanical engineer, Division of Architecture, State of California. Mr. Grant spoke on *Laundry Ventilation* which included a discussion on lint collection equipment and the special handling accorded drycleaning rooms.

The other speaker also introduced by President McKinsey was Loren Woolf, sales supervisor, Pacific Gas & Electric Co., whose topic was *Gas Service Regulations and Rate Schedules*.

Vice President Marshall reported that the October 7 meeting will feature a talk on *High Pressure Air Distribution* by C. M. Wilson, chief engineer, Anemostat Corp. of America. Attendance 46. Attendance ratio 0.43

• *SOUTH TEXAS*: The May meeting was presided over by Pres. C. L. Fleming at the Alabama Catering Service. Society President Reg. F. Taylor installed the new officers for 1953-54 as follows: *President* — E. G. Floeter, Jr.; *Vice President* — J. W. Holland; *Secretary* — F. M. Neil; *Treasurer* — J. C. Lewis; and *Board of Governors*: A. B. Ullrich, Jr. and O. G. Rivoire.

President Taylor also presented Retiring President Fleming with a past president's pin. Newly elected President Floeter delegated D. S. Freese to submit plans for a picnic to be announced at a later date.

There were two guest speakers; D. S. Cooper, owner of Dale S. Cooper Associates, and I. A. Naman, owner of I. A. Naman, Construction Engineers, both of Houston. Mr. Cooper spoke on *Application of Warm Air Furnaces to Cooling Systems*, while Mr. Naman's topic was *Hot Water and Steam Heating Systems*. Attendance 73. Attendance ratio 0.36.

• *SOUTHERN CALIFORNIA*: The June meeting featured two guest speakers, Lawrence McConville, State Division of Highways, whose subject was *The Freeway Program in the Los Angeles Area;* and George Serfass, Tennity & Serfass, who gave a talk on *Air Conditioning Installation in CBS Television City*. A lively question and answer period followed.

This meeting was presided over by Pres. J. S. Earhart at the Carolina Pines. He introduced the new officers and thanked the retiring officers for their cooperation during his presidency. Attendance 85.

• *SOUTHERN CALIFORNIA*: The May meeting was called to order by Pres. J. S. Earhart at the Carolina Pines. A. J. Hess announced that the following new officers had been unanimously elected: *President* — L. B. Davenport; *Vice President* — C. D. Walz; *Secretary* — J. L. McCullough; *Treasurer* — H. F. Ulovec; *Board of Governors*: J. S. Earhart, E. D. Pierce, F. B. Gardner, T. A. Marshall, and L. R. Kelly.

R. H. Phillips, Carrier Corp., Los Angeles, Calif., gave an interesting talk on *Absorption Refrigeration*. Attendance 87.

• *SOUTHERN PIEDMONT*: Guest speaker, J. J. Tyson of Atlanta, Ga., gave an interesting and informative talk on *The Application of Direct-Fired Duct Heaters*. With the advent of natural gas to this area, it was a very timely talk.

J. A. Rice, general chairman of the summer meeting, reported on the plans for the June meeting at Roaring Gap, N. C.

The May meeting was called to order by Pres. R. E. Mason at the Selwyn Hotel. Attendance 28.

• *WASHINGTON, D. C.*: The May meeting consisted of the Annual Ladies' Night held jointly with the Engineers Club of Washington at the Congressional Country Club, Montgomery County, Md. It was estimated that three-quarters of those attending were Chapter members. Since this was a social gathering no business was transacted. Attendance 139.

• *WESTERN MICHIGAN*: Pres. H. R. Limbacher presided at the May meeting which was held at the Kalamazoo Country Club. C. H. Pesterfield and L. G. Miller directed the installation of officers for the new year as follows: *President* — J. T. Anderson; *Vice President* — F. W. Brundage; *Secretary* — R. J. Waalkes; *Treasurer* — S. N. Paganelli; *Board of Governors*: H. R. Limbacher, R. L. Wells, and N. A. Buckley.

Dean Miller was called upon to present the bronze plaque to Retiring President Limbacher who in turn presented the Chapter Charter to newly elected President Anderson. The meeting was concluded with the showing of two films, *Florida Keys* and *Air Trails to Alaska*. Attendance 98.

• *WESTERN NEW YORK*: The June meeting was called to order by Pres. C. W. Stone at the University Club in Rochester. Then M. C. Beman was appointed as Member and Roswell Farnham as Alternate Member on the Chapters Conference Committee to represent the Chapter at the Semi-Annual Meeting in Denver.

R. E. Lang announced the tentative program for the new season as follows: *October*- either a meeting sponsored by Valley Forge or a field trip through the Schoellkopf Station at Niagara Falls; *November*-joint meeting with *ASRE; December*-Christmas Party; *January*- open; *February and March*- open, but with the possibility that Westinghouse Corp. may sponsor either meeting; *April*- joint meeting with Central New York Chapter in Rochester; and *May*-election of officers and Old Timers' Night.

C. W. Kaupp, secretary, suggested the dues be raised from $3.00 to $5.00. The motion was accepted. It was decided to send a letter to the New York State Building Code Commission informing them that the Chapter's Building Code Committee approved of the New York State Multiple Dwelling Code. Attendance 10. Attendance ratio 0.14.

• *WISCONSIN*: The members of the Chapter were honored at their May meeting by having as their guest, Society President, Reg. F. Taylor, who spoke on *Yesterday, Today and Tomorrow*. President Taylor gave a stimulating talk on the history of the Society, its current activities and outstanding members. He also stressed the fact that as the Society progresses it contributes more and more to the health and welfare of mankind.

Pres. J. A. Lofte called the meeting to order and then announced the new officers as follows: *President* — N. E. Hill; *Vice President* — L. C. Plaehn; *Treasurer* — I. J. Rossiter; *Secretary* — H. K. Forfar; *Board of Governors*: J. R. Vernon, H. H. Valiquet, and J. A. Lofte.

Society past president Ernest Szekely presented a Life Membership certificate to J. A. Cutler, past president of the Illinois Chapter and a member of the Society since 1920. In turn Mr. Szekely himself received a Life Membership certificate.

Newly elected President Hill accepted the gavel of office and as his first act presented Retiring President Lofte with a past president's pin. Attendance 31. Attendance ratio 0.11.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 93 applications for membership, including 3 reinstatements; in addition 3 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by August 31, 1953, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement

Arizona

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LOFTUS, G. M., Sales Engr., Fiberglas Engineering & Supply Co., Phoenix. REFERENCES: John Boylson, V. J. Carns, A. J. Holtkamp, W. A. Kopp.

TURNER, J. C., Design Engr., Frank Harmonson Co., Phoenix. REFERENCES: C. H. Burnap, V. J. Carns, W. T. Miller, H. A. Soper.

California

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BECKETT, J. C., Chief Engr., Wesix Electric Heater Co., San Francisco. REFERENCES: C. E. Bentley, F. W. Jordan, H. C. Murphy, G. M. Simonson.

MARTIN, C. M., Owner, Charles M. Martin Co., San Francisco. REFERENCES: K. F. Baldwin, Jr., J. E. Murray, C. B. Smith, N. S. Wright, Jr.

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MCLAUGHLIN, C. E., Field Engr., American Blower Corp., San Francisco. REFERENCES: G. N. Aranovsky, L. J. Brown, L. H. Cochran, D. R. Dickson.

Colorado

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District of Columbia

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Illinois

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Iowa

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Kentucky

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Louisiana

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FRY, R. J., Engr., Air Conduit Co., Lake Charles. REFERENCES: W. H. Dudley, Jr., J. E. Heinisch, W. B. Moses, Jr., R. K. Rothrock.

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Maryland

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Massachusetts

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Michigan

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North Dakota

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New Jersey

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New Mexico

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New York

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Pennsylvania

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South Carolina

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JOURNAL SECTION

Texas

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Washington

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Wisconsin

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Wyoming

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Canada

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Belgium

HOUBERECHTS, ANDRE, Prof. University of Louvain, Hasselt. REFERENCES: M. Barcza*, R. Peter*, H. Van Waeyenbergh*, M. Veron*.

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MAIN, R. H., Refrig. Engr., Edward L. Bateman, Ltd., Johannesburg. REFERENCES: S. F. Gimkey*, J. L. Reekie*, C. E. Renninger*, W. J. Walker*.

D. O. PRICE IN NEW POST

The appointment of D. O. Price as regional district manager for the new Toronto office of Marine Industries Ltd., Heating Division, was announced by manager O. E. Guevremont.

Mr. Price, a member of ASHVE, has had more than 30 years' experience in the heating and air conditioning field. Starting his career with McClary Manufacturing Co. in Hamilton, he went later to its Brantford subsidiary, Happy Thought Foundry Co. Upon formation of General Steel Wares Ltd., he came to Toronto to head its Heating and Air Conditioning Division. For the past seven years, Mr. Price has been vice president and a director of Price Air Conditioning Co. Ltd., Toronto.

IN MEMORIAM

Dr. Homer Addams
1873-1953

THE UNEXPECTED news of the passing on July 3 of Dr. Homer Addams at the age of 80 greatly shocked the Officers, Council, and members of the Society. A Charter Member and Past President of ASHVE, Dr. Addams was one of the 75 organizers of the Society. At the time of his death he was chairman of the Board of Directors, Fitzgibbons Boiler Co., Inc., New York, N.Y.

Dr. Addams was born on June 22, 1873, in Addamstown, Pa., a town established by his ancestors in the early 1700's. He began his business career at the age of 15 after completion of preliminary education in public schools in the Addamstown area and in the Schuylkill Seminary. The desire for education was so great that he managed to combine business with study, taking whatever business and engineering courses he could in his off-hours.

His first job was as a helper, installing heating plants in Eastern Pennsylvania. In 1895, after completing his education and acquiring his basic experience, he joined the staff of Barber and Ross, a heating contracting firm of Washington, D.C., as an estimator and engineer in charge of construction. Dr. Addams joined a group of cast-iron boiler manufacturers in Philadelphia in 1896 and handled development, engineering and research of their products. During that same year, he was among that enterprising group of engineers who met in New York City to form THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, thus contributing a new concept of comfort, health and well-being for people everywhere.

In 1903, Dr. Addams was employed by the Kewanee Boiler Co. of Illinois and was sent to Washington as a special representative to contact Government agencies and to act as a consultant on various heating projects. He rejoined the Kewanee Co. in 1911 to set up a New York branch and also to serve as sales manager of the operation. From 1911-18, he spent much time in Washington as a liaison representative between the company and the Government on the design and development of boilers and hot water heaters.

Foreseeing the extended growth of construction along the eastern seaboard and the prospect of sizeable business volumes, Dr. Addams joined with the Kewanee Boiler Co. of Illinois in 1920 to form a subsidiary company known as the Kewanee Boiler Co. of New York. His initial position with the new firm was vice president, but in 1921 he became president. The same year he acquired the Fitzgibbons Boiler Co., of Oswego, N.Y., and also became its president. He resigned as president in 1947 and was succeeded by his son Paul K. Addams. Concurrently he became chairman of the Board of Directors of the firm and pursued his responsibilities with the same fervor that marked his long and outstanding career.

Dr. Addams' career has closely paralleled that of ASHVE, being identified with the advancement of engineering practice, research and development techniques in the field of heating and air conditioning. He was honored by the Society in 1952 when he received the F. Paul Anderson Medal in recognition of his notable contributions to the advancement of the art in the fields of boiler design and performance. In the previous year, Dr. Addams was awarded the Degree of Doctor of Science from Albright College, Reading, Pa.

Distinguished by an outstanding record of service to the Society, Dr. Addams participated in its work for many decades. He served as president in 1924; first vice president in 1923; treasurer 1915-22; and on the Council 1915-22. In addition, he was active in the founding of the Society's Research Laboratory at the United States Bureau of Mines, Pittsburgh, Pa., in 1919, and was a member of the first Guide Committee in 1922. He served the Society in many capacities and among his various committee assignments were the following:

1916-17	Executive Committee
1919-20	
1922-23	
1916-17	Committtee on Education and Publicity
1918-19	Finance Committee
1921-23	
1918-25	Committee on Code for Testing Low Pressure Heating Boilers
1919-26	Committee on Research
1919-25	Committee to Confer with A.S.M.E., Boiler Code Committee on Heating Boilers
1920	Membership Committee
1922	Treasurer, Executive Committee on Research Treasurer, Guide Publication Committee
1925-53	Advisory Board
1926	Nominating Committee
1949	F. Paul Anderson Award Committee

He also held memberships in the *American Society of Mechanical Engineers*, the *American Uniform Boiler Law Society*, the *Steel Boiler Insitute, Inc.*, the Engineers Club of New York, the Engineers Club of Philadelphia and the Greenleaf Lodge, F. & A. M., Allentown, Pa.

Dr. Addams will be keenly missed by his friends and associates in the Society to whom he was a constant source of inspiration. He was one of the Society's great leaders and his ideals will be cherished by his fellow members. Dr. Addams' name will go on record as one of the Society's immortals.

Surviving Dr. Addams are his wife, the former Elizabeth Swartz and his son Paul K., to whom the Officers, Council and members of the Society extend their deepest sympathies.

Funeral services were held at 2:00 p.m., Monday, July 6, at the William L. Turner Memorial Chapel, First Methodist Church, Germantown, Pa.

Dr. Frederick E. Giesecke

1869-1953

THE MANY Society friends and associates of Dr. Frederick E. Giesecke of New Braunfels, Tex., were greatly saddened to learn of his death on June 27, in his 84th year. The "Pal", as he was fondly called because of his outstanding benevolence to all those he came in contact with, was an eminent authority on heating and ventilating, being distinguished for his researches in the fields of hot water heating, heat transmission and air conditioning for comfort. He was also considered an expert on radiant heating methods.

A Past President and Life Member of ASHVE, Dr. Giesecke was born on January 28, 1869 in Washington County, Tex., and received his preparatory education in the New Braunfels and San Antonio schools. He began his professional career at the A. and M. College of Texas, College Station, Tex., from which he received his M.E. in 1890. In 1904 he received a degree of S.B. from the Massachusetts Institute of Technology, and from 1886 to 1912 he was a teacher at the Texas A. and M. College. In 1906-07 he studied European heating and ventilating methods in Germany. As college architect he designed and directed installations of heating systems in new buildings from 1908 to 1912.

Dr. Giesecke, in 1913, became professor of Architecture at the University of Texas, Austin, as well as consulting architect. He received a doctor's degree from the University of Illinois in 1924. From 1927 to 1939, he was Director of the Engineering Station at A. & M. College of Texas. At the time of his death, Dr. Giesecke was Professor Emeritus at the College and a consulting engineer.

In 1942 Dr. Giesecke received the F. Paul Anderson Gold Medal awarded by the Society for distinguished scientific achievement. The Committee on Award honored Dr. Giesecke for his notable contributions to the advancement of heating based on his research work in the fields of heat transfer and hot water heating, and for his services to the Society as a member and officer.

He was the author of several technical books, including *The Design of Gravity-Circulation Water Heating Systems*, published in 1926, and the joint author with A. Mitchell and H. G. Spencer of *Technical Drawing*, and *Technical Drawing Problems*, and other technical books and papers.

Dr. Giesecke was President of the Society in 1940, First Vice President in 1939, Second Vice President in 1938, served on the Council from 1932-41 and on the Advisory Board from 1941-53. He also served as Chairman of the Executive Committee and on many Research Technical Advisory Committees of the Society. He was secretary of the Austin, Tex. Chapter from 1917-1919. Extremely active in Society affairs, Dr. Giesecke served on numerous committees as follows:

1921-22	Sub-Committee on Pipe Sizes
1922-24	Committee on Steam and Return Main Sizes
1925	Committee on Pipe Sizes
1929-31	Committee on Research
1929-30	TAC on Pipe Sizes for Heating Systems
1931-34	TAC on Pipe and Tubing (Sizes) Carrying Low Pressure Steam or Hot Water
1931	TAC on Radiation—Direct and Indirect
1932-34	Committee on Research
1932	TAC on Infiltration in Buildings
1933	Guide Publication Committee
1934	Executive Committee
1934-36	Cooperating Committee-ASHVE Representative on National Research Council
1935-36	Committee of the Council on Meetings
1936	TAC on Comfort Requirements for Summer Cooling
1937-41	Executive Committee of the Council
1937	TAC on Comfort Air Conditioning-OH-22 TAC on Intermittent Heating-1P-20
1939, 41, 1943, 45-47, 1949,	F. Paul Anderson Award
1939	Committee on Engineering Scholarships
1943	TAC on Radiation with Gravity Air Circulation
1943-45	TAC on Flow of Fluids through Pipes and Fittings
1944-46	Committee on Research

1944 TAC on Heat Requirements of Buildings
1944-46 TAC on Radiation and Comfort
1947-53 TAC on Panel Heating and Cooling-Group A-Heat Distribution Within and Behind the Panel

Listed in *Who's Who In Engineering*, Dr. Giesecke was held in high esteem by leaders in both the engineering and architectural fields. He was a member of *ASEE, AAAS, ASCE, ASME* and the honorary fraternities, *Sigma Xi* and *Tau Beta Pi*.

Dr. Giesecke will be remembered not only for his many fine contributions as an educator, engineer and architect, but for his benevolence to all those who came in contact with him. He was always available for counsel and help. The Officers and members of the Society will deeply feel the loss of Dr. Giesecke and will long cherish his memory.

Surviving Dr. Giesecke are his wife, the former Hulda C. Gruene, and three daughters, to whom the Officers, Council and members extend their profound sympathies.

L. A. Harding
1876-1953

IT WAS WITH deep sorrow that the Society learned of the death of Louis Allen Harding at his home in Buffalo, N. Y. on July 8 at the age of 76. He joined the Society in 1911, served as its president in 1930, and was a Life Member. Mr. Harding was born on October 16, 1876 in Factoryville, Pa. He received his preliminary education at the Hackettstown Seminary and later attended Penn State College, State College, Pa., where in 1899 he received his degrees of B.S. and M.E. For several years he was a draftsman for Dickson Mfg. Co., in 1901 joined Lackawanna Steel Co., and later was superintendent of Washeries for Lackawanna Coal & Coke Co. Between engineering engagements he was an instructor at Cornell University in 1902, professor of machine design and head of the mechanical engineering department at Penn State College 1905-06, and professor of Mechanical Engineering at the University of Illinois 1913-17. He was a member of the firm of Pennsylvania Engineering Co., and later chief engineer of Armstrong Cork Co.

Mr. Harding came to Buffalo and entered the contracting field as a partner of Cummings and Harding, then became chief engineer of John Cowper Co. In 1921 the consulting firm of Harding & Crea was organized, and in 1925 he organized the L. A. Harding Construction Co. of which he was president. He was president of Harding-Carlton Inc., an officer of the Wilkinson-Harding Corp., a real estate firm, and the Leach Steel Corp., of Rochester, a structural firm. In his consulting

and construction work he was responsible for the design of the mechanical equipment for hundreds of plants, and built many industrial buildings.

A man of great versatility as an engineer, scientist, educator and scholar, Mr. Harding was acclaimed for his leadership and his organizing ability. He was a prodigious reader and a frequent contributor to engineering and scientific periodicals. As co-author with Dr. A. C. Willard he wrote two volumes on Mechanical Equipment of Buildings, Steam Power Plants, and more recently books on mathematics and navigation. He contributed sections to Kents Engineers Handbook and Kidders Architects and Builders Handbook.

In 1937 he became interested in local politics and although a life long Republican he was a key member of Democratic Mayor Thomas Hollings' administration, serving for nearly four years as Commissioner of Public Works of the City of Buffalo. He brought in a new era where ability, economy and integrity were the yardsticks of his accomplishments which are legendary.

Mr. Harding largely designed and checked plans for the Airport Administration Building. The Memorial Auditorium was built under his personal inspection.

Following his community service he returned to his engineering business and to continue his writing, but had been in retirement for the past few years.

Mr. Harding became a member of the Society in 1911 and was always active in its affairs. He was president in 1930; first vice president in 1929; second vice president in 1928; and served on the Council from 1922-31. Mr. Harding was one of the founders of Western New York Chapter and served as president in 1921, and on its Board of Governors from 1927-35.

During his Society membership of 42 years he served on many committees as a member or as chairman, among which are the following:

1912-16 Committee on Tests
1917 Committee on Code for Testing Low Pressure Heating Boilers
1919 Nominating Committee
1919-22 Committee to Confer with ASME Boiler Code Committee on Heating Boilers
1920-21 Committee on Steam and Return Sizes
1921-22 Committee on Standard Code for Testing Heating Systems
1923-28 Committee on Code of Minimum Requirements for Heating and Ventilating of Buildings
1923 Committee on Furnace Heating
1924-28 Chairman, Publication Committee

1925-26 Guide Publication Committee
1926-27 Committee on Heat Transmission Through Buildings
1928-31-32 Committee on Heat Transmission
1929-33 Executive Committee of the Council
1929-32
33-34 Committee on Research
1929-30-34 Committee for Interpreting Code for Rating Low Pressure Heating Boilers
1931-32 Committee on Meetings
1931 Committee on Definitions
1932-52 Advisory Council
1932 Committee on Ventilation of Bus Terminals
1932-34 Committee on Ventilation Standards
1933 Committee on Nomenclature
1935 F. Paul Anderson Award Committee
1936-37 TAC on Insulation
1936-37 Chairman ASHVE-*ASRE* Committee on Standards for Air Conditioning Applications.

His unselfish service to the Society will be treasured by his many friends and associates and his name will be indelibly inscribed in the records of ASHVE.

He was a prominent Mason, a fellow of *The American Society of Mechanical Engineers*, a member of the *American Society of Civil Engineers*, Sigma Psi, Phi Kappa Sigma, Pi Tau Sigma, as well as a number of other societies and clubs. He is listed in Who's Who in America and Who's Who in Engineering.

Those who had the opportunity of working with Mr. Harding know the inspiration of his leadership, his willingness to share his vast knowledge and experience with others, his soft spoken manner, but as a hard fighter for the principles he believed in. His friendly presence and delightful wit will be greatly missed by his friends who are legion, and regard him as the complete engineer.

He is survived by his wife, Mrs. Charlotte Hanes Harding to whom the officers and members of the Society extend their deep sympathies.

Services were conducted at 2 p. m., Saturday, July 11 in Forest Lawn Chapel, Buffalo, N. Y.

GEORGE R. MANSELL
Toronto, Ont., Canada

George R. Mansell, member of the Society since 1947, died in his home on May 31.

Mr. Mansell was born in Toronto, Ont., Canada, on July 13, 1892, and attended the University of Toronto. During his career, Mr. Mansell specialized in estimating, drafting, designing and supervising installations for heating and ventilating systems and power plants. He was a veteran of World War I and saw action in France. Mr. Mansell had been associated with Purdy Mansell, Ltd. for 40 years and was vice president at the time of his death.

He was also a member of the Toronto Downtown Progress Club, Kingsway Lodge, AF and AM and Runnymede United Church.

The Officers and Council of the Society extend their profound sympathy to his widow, the former Elspeth Tennannt, two daughters, Mrs. R. Eastmore and Evelyn R. Mansell, a son, J. M. Mansell, a sister, Mrs. J. Quinn and a brother, P. C. Mansell.

EDWARD O. SMITH
Pittsburgh, Pa.

The Society learned with sorrow that Edward O. Smith, assistant manager of the inspection department of the Eastern Gas and Fuel Associates, recently passed away. Mr. Smith became a member of the Society in 1947.

Born in 1895 in Pittsburgh, Pa., Mr. Smith attended Carnegie Institute of Technology. He participated in many kinds of work, but in later years specialized in fuel supplies and its applications.

Mr. Smith was an elder of the Watson Presbyterian Church and a member of McCandless Lodge, F&AM, American Legion Post No. 81 and Kiwanis.

The Officers and Council of the Society extend their sincere sympathy to his widow, Marie Carr Smith; one daughter, Joyce Ann Smith; two sisters, Mrs. Loyal B. Aldrich of Pittsburgh and Mrs. Ella Smith of Washington, D.C.; two brothers, Sydney and George F. Smith of Pittsburgh.

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Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

● **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, Herman Cumnock, 401 W. Capitol Ave. SECRETARY, W. J. Franklin, 619 Rector Bldg.

● **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. G. Croley, 400 Batavia St., East Point, Ga. SECRETARY, T. A. Barrow, 157 Simpson St., N.W.

● **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, H. D. Glaser, Federal Land Bank Bldg., 2315 St. Paul St. (18). SECRETARY, G. J. Senner, 6010 Edmonson Ave. (28).

● **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. PRESIDENT, C. W. Leek, 1155 West 49th Ave. SECRETARY, D. A. English, 6412 Adera St.

● **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, C. R. Acheson, 306 W. Genesee St. SECRETARY, H. K. Ormsby, 205 S. Townsend St. (2).

● **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, N. T. Hess, 63 E. Goodale St. SECRETARY, R. A. Wilson, 20 S. Third St., (15).

● **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, R. C. Beineke, 626 Broadway, (2). SECRETARY, A. H. Gerdsen, 224 E. Second St., (2).

● **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, G. F. Nieske, 165 Maple St., Naugatuck. SECRETARY, E. J. Hoagland, 257 S. Whitney St., Hartford.

● **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, H. L. Salaun, 317 Baronne St. SECRETARY, T. J. Jenny, 1000 S. Peters St., (9).

● **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. PRESIDENT, N. W. Burrill, 33 Riverside Ave., Rensselaer. SECRETARY, L. V. Appleby, R.D. 2, Watervliet.

● **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, J. E. Murray, 350 Mission St. (5). SECRETARY, D. E. McLeod, 3740 Clay St. (18).

● **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, H. G. Chapin, 185 N. Wabash Ave., (1). SECRETARY, H. G. Gragg, 4065 Grand Ave., Western Springs.

● **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, R. C. Blackman, 5505 N. Illinois St., (8). SECRETARY, J. W. Jackson, 3514 N. Drexel, (18).

● **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, G. M. Dieter, 917 W. Mallon. SECRETARY, F. W. Jenkinson, N. 1904 Smith St., (15).

● **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, R. H. Schnell, 4119 Northwest Dr. (10). SECRETARY, Bowen Campbell, 1435 Casady Dr. (5).

● **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, R. L. Pennington, 520 So. Commerce (2). SECRETARY, O. B. Strahm, 601 So. Terrace Dr.

● **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, G. H. Stoffer, 200 Riss Building (6). SECRETARY, A. S. Hurt, Jr., 2119 Washington St., (8).

● **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Third Thursday. PRESIDENT, A. K. Piercy, 222 Osborne St. N. SECRETARY,, D. B. Brace, 1550 Dublin Ave.

● **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, A. L. Hare, 127 Federal St. (10). SECRETARY, W. G. Martin, Jr., 20 Winchester St. (16).

● **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, W. L. Drake, 15 N. Reese. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).

● **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT, John Schweiger, 593 Acorn Drive, Dayton (9). SECRETARY, D. E. Tullis, 743 Kiser St. (4).

● **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, R. H. Oberschulte, 316 McKerchey Building, (1). SECRETARY, D. S. Falk, 4864 Woodward Ave. (1).

● **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, E. T. Erickson, 500 Baker Arcade. SECRETARY, V. E. Pearson, 739 Marquette Ave. (2).

● **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRESIDENT, Burt Lomax, Jr., P. O. Box 1662. SECRETARY, J. G. Coleman, 2840 Arbor Hills Drive.

● **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, B. J. Horsburgh, 940 Ogilvy Ave. (15). SECRETARY, R. J. Ker, 1000 Beaver Hall Hill, P. O. Box 340.

● **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, S. W. Black, 18th & Harney Sts. SECRETARY, H. H. Ulrich, 608 City Hall (2).

● **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, J. E. Schechter, 28 Brower Ave., Woodmere, L. I. SECRETARY, Carl H. Flink, 62 Worth St. (13).

● **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, F. H. Faust, 5 Lawrence St., Bloomfield. SECRETARY, C. H. Smith, 2490 Vreeland Mills Rd., Linden.

● **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, P. N. Vinther, 929 Mercantile Securities Bldg. SECRETARY, J. A. Ray, 4411 Belmont Ave. (4).

● **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, J. N. Watt, 528 E. Fifth. SECRETARY, J. C. Netherton, Jr., 3130 E. 44th St.

● **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, Second Monday. PRESIDENT, R. E. Sherman, 570 Hanna Bldg. (15). SECRETARY, R. G. Huebscher, 7218 Euclid Ave. (3).

● **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. PRESIDENT, J. E. Hart, 1001 E. Bessemer Ave. SECRETARY, S. T. Oliver, 2307 Fairfield Ave.

● **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, W. J. Collins, Jr., 1708 Westminster Pl. SECRETARY, F. X. Loeffler, Jr., 1604 N. W. Fifth St.

● **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, N. W. Kingsland, 31 Willcocks St. SECRETARY, H. R. Roth, 57 Bloor St., W.

● **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, A. N. Hoss, 621 S.W. Alder (5). SECRETARY, J. E. Finkbeiner, 10260 S.W. Daphne Pl. (1).

● **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. PRESIDENT, Bernard Stotesbury, 955 Somerset St. W. SECRETARY, E. J. Schoenherr, 32 Clarey Ave. (1).

● **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, W. B. Pride, 3111 Dose Ter. (44). SECRETARY, I. L. Winsor, 20031 Marine View Dr. S.W. (66).

● **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, C. F. Dietz, 3449 W. Indiana Ave. (32). SECRETARY, P. H. Yeomans, Architects Building (3).

● **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, B. B. Reilly, Fifth & Liberty Aves. (22). SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).

● **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, H. L. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.

● **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. PRESIDENT, E. C. McKinsey, 4220 Annette (21). SECRETARY, R. A. Sarro, 5412 Argo Way.

● **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, H. C. Sharp, 4060 W. Pine Blvd. (8). SECRETARY, W. P. Norris, 1118 Fullerton Bldg.

● **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, M. A. Hudson, 753 Gladstone Blvd. SECRETARY, R. S. Segall, 603 Cotton St.

● **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, E. G. Floeter, Jr., P.O. Box 6006 (6). SECRETARY, F. M. Neil, 3513 W. Dallas Ave. (19).

● **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, L. B. Davenport, 137 S. Anderson St. (33). SECRETARY, J. L. McCullough, 1978 S. Los Angeles St. (11).

● **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. E. Mason, 1726 Hutchinson Ave. (1). SECRETARY, S. B. Blanton, Box 6096.

● **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, D. E. Locher, Box 949, Corpus Christi. SECRETARY, F. B. Frazee, 1013 Riverside Dr., Austin.

● **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, M. L. Gollaher, 1163 Roosevelt Ave. (5). SECRETARY, G. L. Soderborg, Sr., 42 E. 8th St. S.

● **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, E. D. Duval, 1023 Hanover Ave. SECRETARY, T. B. Carpenter, 412 Chester St.

● **WASHINGTON, D. C.** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, I. G. Muirheid, Bureau of Ships, Navy Dept. (25). SECRETARY, W. C. Reamy, Jr., 17th & Pennsylvania Ave., N. W. (6).

● **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, Second Monday. PRESIDENT, J. T. Anderson, Michigan State College, East Lansing. SECRETARY, R. J. Waalkes, Michigan State College, East Lansing.

● **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, C. W. Stone, 503 Franklin St. (2). SECRETARY, C. W. Kaupp, 271 Delaware Ave.

● **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, N. E. Hill, 122 N. Hartwell Ave., Waukesha. SECRETARY, K. H. Fortar, 2711 N. 27th St. (10).

SPECIAL BRANCH

● **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT, Leo de Bruyn, Muhlebachstr, 172, Zurich. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

STUDENT BRANCHES

● **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Sydney Narvey, 5-B Vetville, State College Station. SECRETARY, E. A. Travis, Jr., P.O. Box 3332, College Station.

● **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. Address mail to: Prof. R. R. Irwin, Dept. of M. E., Oklahoma A. & M. College.

● **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. E. Bulletsel, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.

● **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, N. J. Kirch, 922 Highland Ave., Lafayette. SECRETARY, H. F. Allen, Jr., 629 University St.

● **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, C. E. Beavers, Box 4083. SECRETARY, C. R. Blank, Jr., Box 2021.

● **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, T. J. Feahney, Jr., 18263 Oak Dr. (21). SECRETARY, W. F. Thull, 18313 New Jersey (19).

● **UNIVERSITY OF KANSAS:** 1949. Hdqrs., Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.

● **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday. PRESIDENT, H. M. Braymer, 1307-C Brackenridge Apts., (3). SECRETARY, A. D. Wilkinson, Jr., 1423-B Brackenridge Apts., (3).

● **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, D. S. Harper, 737 Sammon Ave. SECRETARY, L. S. Mitchell, 88 Lawrence Crescent.

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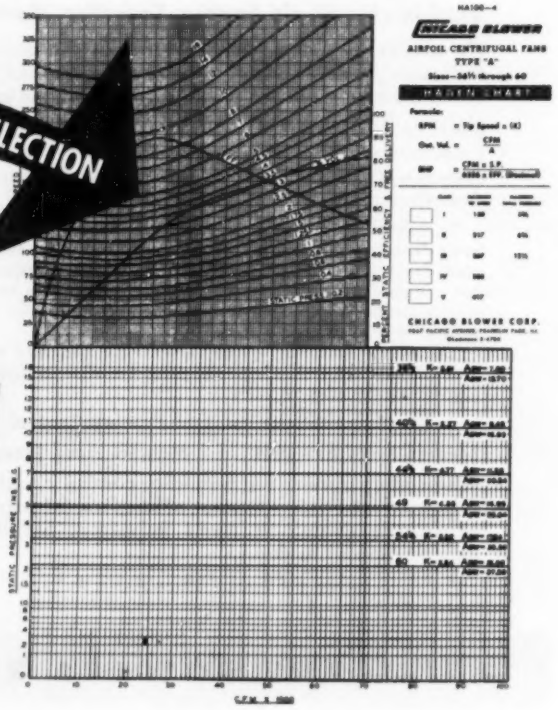

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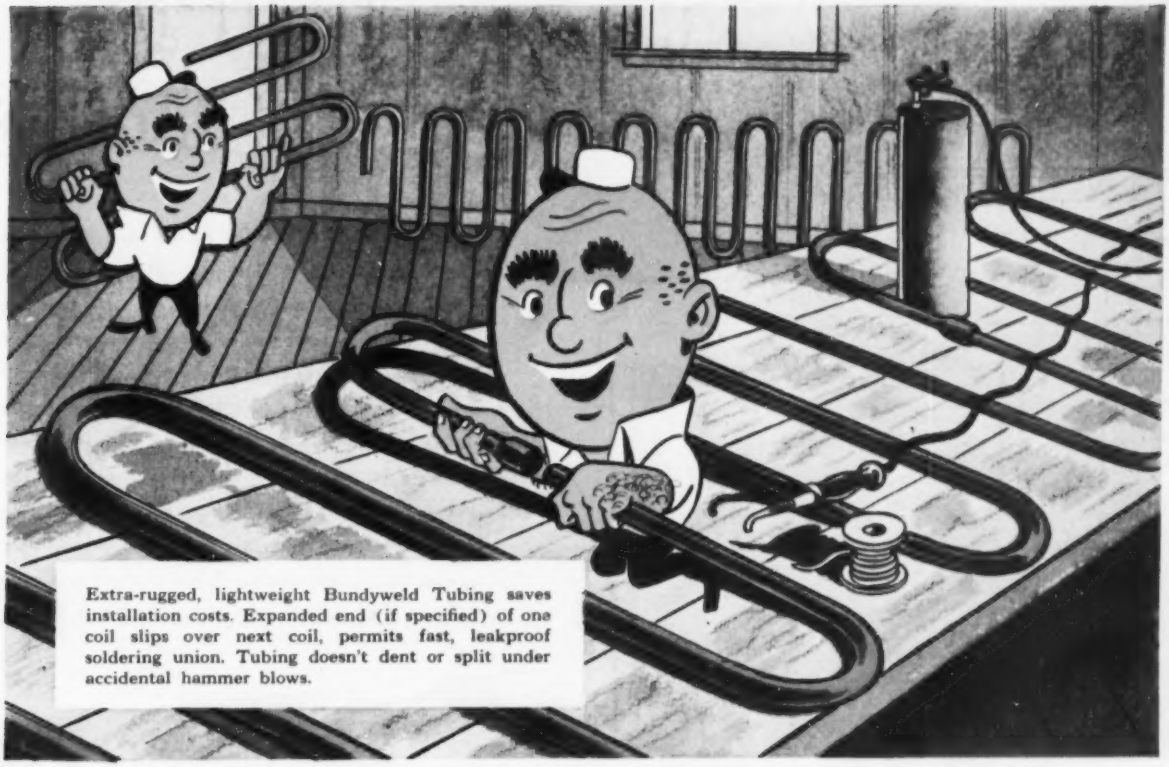

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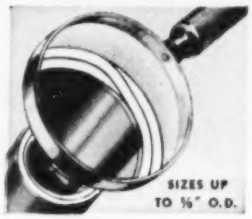

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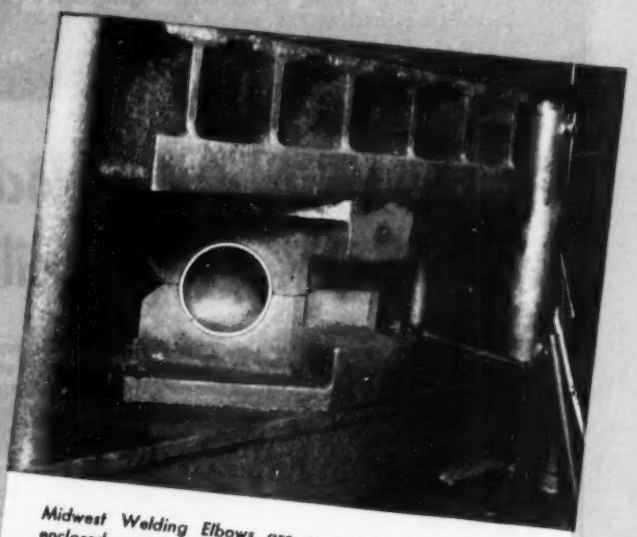

Midwest Welding Elbows are accurately sized in totally enclosed compression dies that exactly control metal distribution throughout fitting. The result is true circular cross section and accurate radius, included arc, and tangents.

MIDWEST PIPING COMPANY, INC.
Main Office: 1450 S. Second St., St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices:
New York 7—30 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 23—520 Anderson St. • Houston 2—1213 Capitol Ave.
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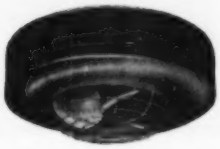
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

MIDWEST WELDING FITTINGS Improve Piping Design and Reduce Costs

BLOWER TYPE HEATING AND VENTILATING UNITS

For effective heat distribution over large open areas. Available in 8 sizes . . . in suspended and floor models, with one and two row coils; capacities from 20,620 to 1,632,000 Btu per hour.



DOWN FLOW UNIT HEATERS

This McQuay "vertical" unit heater, suspended near the ceiling, utilizes the warm air in that area and distributes it down to the floor level. No wasted heat, no cold spots. Four types of draftless diffusers available. Capacities from 25,400 to 500,000 Btu per hour.

When approaching cold weather gives your customers the urge to fly south with the "honkers", tell them to buy instead the comfort and satisfaction that McQuay Horizontal Unit Heaters can give them.

McQuay Horizontal Unit Heaters are made in a wide range of capacities, from 21,600 to 360,000 Btu per hour. Every unit has the exclusive Ripple Fin Coil construction . . . with these advantages: more heat transfer surface, greater flexible strength, cleaner operation . . . flexible copper tube headers to accommodate unequal expansion and contraction. Tubes expanded into fins having wide, smooth collars, without use of any low conductivity bonding agents, provide a permanent mechanical bond.

These advantages, plus modern cabinet styling, quiet motor fan assembly and Test Code Ratings are your guarantee of satisfied customers—especially if you convince them the time to get the job done is now—before, not after, the heat is needed. Write for catalog. Representatives in principal cities. McQuay Inc., 1601 Broadway St. N.E., Minneapolis 13, Minnesota.

McQuay INC.

N E W S

MAKE THE SEASONS COME TO YOU

AIR CONDITIONING • HEATING REFRIGERATION

Spartanburg schools are proud of their Will-Burt Stokers

SPARTANBURG CITY SCHOOLS
SPARTANBURG, S. C.

J. G. McCRACKEN
SUPERINTENDENT

ANN E. BULL
SECRETARY

October 30, 1952

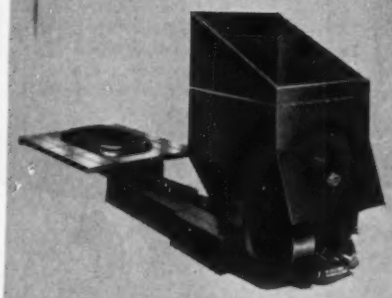
Will-Burt Stoker Company
Orrville, Ohio

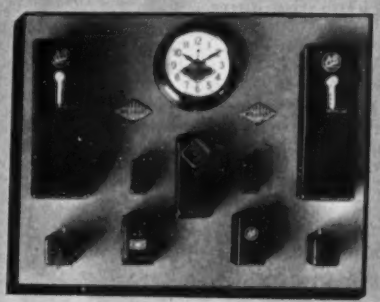
Gentlemen:

We would like to take this opportunity to tell you how pleased we are with our Will-Burt equipment. During the past summer we remodeled our boiler room at the Spartanburg High School and installed two of your 600# Hopper Type Dead Plate stokers. Also, installed was your #PB2K Will-Burt stoker control panel board inter connected for the operation of two Will-Burt stokers. We are very proud of this installation and would recommend Will-Burt to anyone interested in stoker equipment.

Sincerely yours,
J. G. McCracken
J. G. McCracken
Superintendent

JGMc:B





This installation was designed by J. C. Harrison, Consulting Engineer, Spartanburg, S. C. The equipment was sold through Montgomery and Crowford, Inc. and installed by the A. D. Carter Company, both of Spartanburg.

Write today for the details on the complete Will-Burt line of bin-feed and hopper model stokers and the new Will-Burt stoker control panel. If you want to specify and sell the most efficient, most reliable coal heating installations, you need to know about Will-Burt.

WILL-BURT

THE WILL-BURT COMPANY

BOX 902 ORRVILLE, OHIO

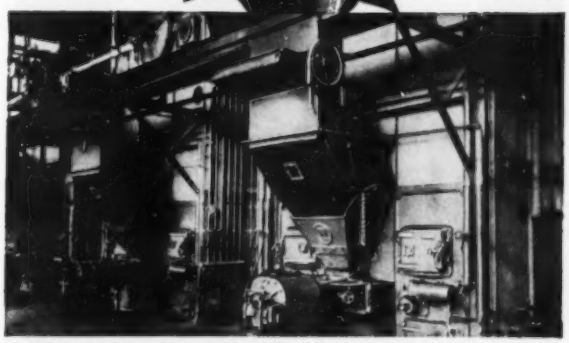
STOKERS • RESIDENTIAL BOILERS • OIL AND GAS CONVERSION BURNERS

"Orchids to Oppenheimer!

THAT NEW COAL HEATING SYSTEM HE DESIGNED SAVED $14,000 THE FIRST YEAR!"

says Carl R. Beckert, President, Thomas Young Orchids, Inc., Bound Brook, N. J.

"We're the largest orchid-growers in the world—Phil Oppenheimer is our consulting engineer. Had to have the most *dependable* heat we could find—steady, quickly available—to protect two million dollars' worth of orchid plants. Our new coal-fired plant gives us that kind of heat—in addition saved us $14,000 the first year! We've discovered that with modern equipment coal is as clean and automatic as any other fuel—and to do the job with oil would have meant an overall cost of 16% more! More than that, we can't take a chance on uncertain winter fuel deliveries. With *bituminous* coal we can store a year's fuel supply right on the ground."



The firing aisle at the new plant. This highly efficient coal equipment cut the company's fuel costs by 23%—is so completely automatic that it saved $6,000 the first year on labor costs, too!

This 300-ton silo that Young installed does away with former handling and shovelling costs. Coal is fed from the silo by a screw conveyor to each boiler's stoker-hopper—the coal is weighed on its trip.

- Use coal now? Get ALL coal's economy with highly efficient modern equipment. Building a new power plant? Find out how much more economical, efficient a job *bituminous* coal can do. Call in a competent consulting engineer. He can show you the modern coal-handling and combustion installations that will save most while meeting your particular needs. Remember you can count on *bituminous* coal! Of America's total fuel reserve—92% is coal! Even today oil is *imported*—while America can and does *export* coal! Ample coal reserves plus the outstanding efficiency of America's mining companies give coal users *the greatest possible assurance of a dependable fuel supply at stable prices.*

If you're running your own steam plant, here are just a few down-to-earth facts you can't afford to ignore!

COAL in most places is today's most economical fuel.

COAL resources in America are adequate for all needs—*for hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
WASHINGTON, D. C.

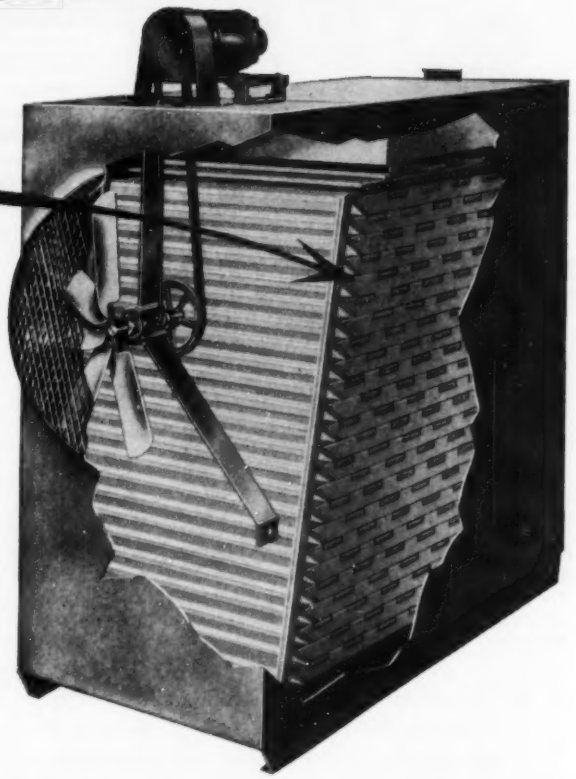
FOR HIGH EFFICIENCY 🔥 *FOR LOW COST*

YOU CAN COUNT ON COAL!

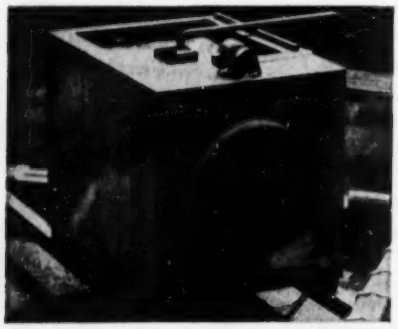
HALSTEAD & MITCHELL COOLING TOWERS

20-Year Guarantee!

On the Wetted Deck Surface of Koppers Pressure-Treated Wood



Here's the industry's greatest cooling tower value . . . "built like a battleship" for 20 years of foolproof performance. Halstead & Mitchell's pioneering in exclusive use of Koppers pressure-treated wood in the wetted deck surface makes possible the unprecedented 20-year guarantee against rotting, and provides the industry's most effective deterrent against fungi growth. Economical, lastworthy . . . the special H & M design for water distribution eliminates, thru the use of an efficient gravity-type distributing pan, extra pumping head required on spray type towers, also cuts down windage losses due to atomizing of water. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service. Easily accessible for cleaning through inlet on back of towers in all sizes.



MORE EFFICIENT IN ANY INSTALLATION

H&M #CT-4000 Induced-Draft Cooling Tower supplying the condensing water for 20 HP and 10 HP water-cooled condensing units in 3-story jewelry storeroom air conditioning. Note open-type distributing pan. This installation also has remote water basin in basement for year-round operation.

2 TONS to 100 TONS

A cooling tower for all applications, from 2 to 100-ton capacities—made by Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers.

AT LEADING WHOLESALERS EVERYWHERE

Write for descriptive bulletin and information on engineering helps.

HOUSING—10 gage (1/8"+) sheet-steel case with 3 coats Bitumastic lining. Electrically welded cabinet. All bolts used are Everdur for ease of disassembly after years of service.

WATER DISTRIBUTION—Gravity type distributing pan eliminates extra pumping head, cuts down windage losses, due to atomizing water.

FAN AND DRIVE—Quiet-operating stainless steel 8-bladed fan, stainless steel shaft, chrome-dipped rust-proofed pulleys. Cast iron bearing supports. Adjustable belt tension.

HM

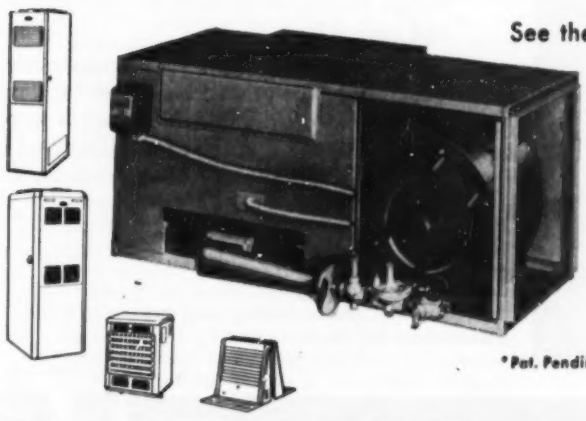
Halstead & Mitchell

OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.

UTILITY'S NEW HORIZONTAL FORCED AIR FURNACES

Here are the ideal forced air furnaces for small home installations. They fit into an attic, under the house or any compact out-of-the-way place to save precious floor space. Easy to install and low in cost, Utility Horizontal Forced Air Furnaces meet competitive conditions on the job.

Equipped with Utility's variable speed Dy-Rekt* Drive Blower these units provide quiet, efficient heating operation because motor shaft and blower wheel shaft are one and the same. No pulleys or belts. Automatic controls, trouble-free operation, fewer service call-backs. For large home heating at small home cost, select Utility Horizontal Forced Air Furnaces. AGA approved.



*Pat. Pending

See the complete UTILITY heating line now

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TRADE MARK

UTILITY APPLIANCE CORP.
4851 S. Alameda St., Los Angeles 58, Calif.

Manufacturers of Gaffers & Sattler and Occidental Automatic Gas Ranges • Utility Automatic Gas Heating Equipment Utility Air Coolers and Blowers

UTILITY APPLIANCE CORP., Dept. HP8
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Please send me free information on:

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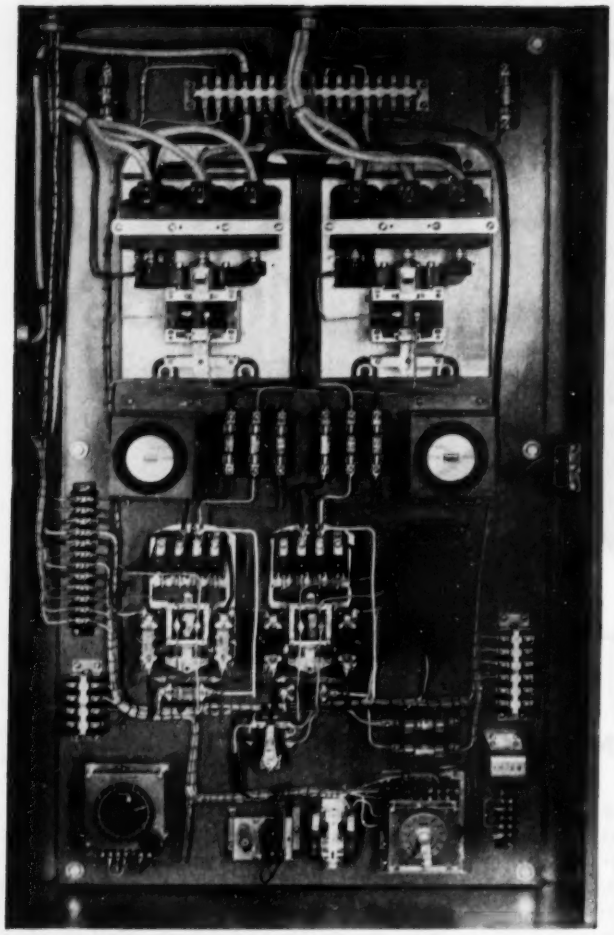


INTERIOR OF CONTROL PANEL shows two Ward Leonard three-pole contactors (near top of photo) and two motor starters (lower half of photo).

Dehumidifier controlled by Ward Leonard contactors and starters

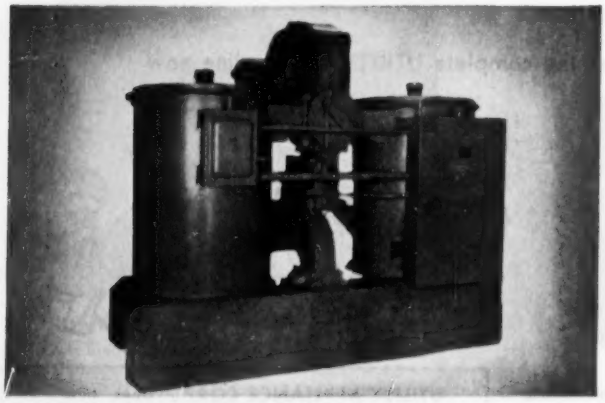
Two Ward Leonard three-pole solenoid contactors and across-the-line starters are an integral part of the control panel of the Desomatic Model DOR-800 Adsorbent Dehumidifier.

Daly, Merritt & Sullivan of Falls Church, Virginia, who manufacture the dehumidifier, needed electrical control components that could be readily installed in a custom control assembly.

The Ward Leonard contactors and starters which they selected fit this requirement because both are self-contained units . . . this results in simplified assembly, fast mounting and easy wiring.

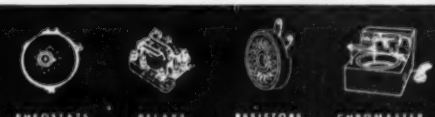
Whatever the electrical requirements of your product, our engineers will be glad to help you select dependable controls to meet them. Write to Ward Leonard Electric Company, 24 South Street, Mt. Vernon, N. Y.

3-35



DESOMATIC DEHUMIDIFIER is used for preservation of equipment during long storage in warehouse buildings.

WARD LEONARD ELECTRIC COMPANY
MOUNT VERNON, NEW YORK

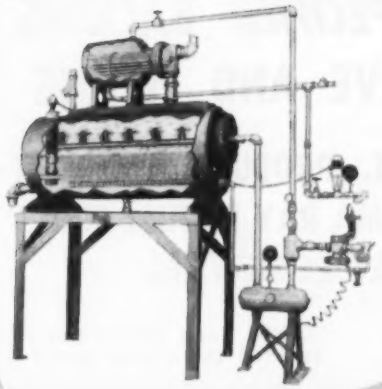


Result-Engineered Controls Since 1892

Ward Leonard's complete engineering text book, "Handbook of Power Resistors," $3 per copy.

a Fresh approach . . . a Major advance . . .

in boiler feedwater deaeration



SCHAUB

ZERO-OXYGEN

Deaerators

NEW DESIGN! NEW PERFORMANCE! NEW SAVINGS!

Complete Oxygen Removal (to .005 cc/liter) • Complete Safety and Dependability • Wide Range for Load Variations • High Thermal Economy • Low Maintenance Costs • Simpler Design for Trouble-Free Service

Start with an idea that's *basically* new and better. Then produce performance beyond the best that ordinary deaerators can deliver. Schaub engineers achieved it . . . developed the all-new deaerator that's a major advance in boiler feedwater deaeration!

Two basic differences give the Schaub Zero-Oxygen Deaerator its outstanding advantages . . . note them well. First, it provides *external* pre-heating to a temperature *above* boiling point, with over-atmospheric pressure held only up to the internal sprayer manifold! Second, a free, non-restricted vent liberates *all* air *immediately* with maximum vapor heat recovery!

From these simple fundamentals stems a whole series of all-important performance benefits. Every engineer or operating man concerned with boiler feedwater deaeration should have the full facts on all-new Schaub Zero-Oxygen Deaerators. Simply send the coupon to get the complete story — promptly.

FRED H. SCHAUB ENGINEERING COMPANY

2116 South Marshall Boulevard • Chicago 23, Illinois

FREE FACTS!
SEND COUPON TODAY
FOR BULLETIN 575

Tells why you need deaeration. Explains basic differences in deaeration systems. Here's the complete story on new Schaub Zero-Oxygen Deaerators.

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2116 South Marshall Boulevard, Chicago 23, Illinois

Please send me without cost or obligation, my personal copy of your new bulletin 575 on Boiler Feedwater Deaeration.

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THE *APPROVED* AND *SPECIFIED* BACKING RINGS FOR WELDING PIPE, VALVE AND FITTING JOINTS

A 100% EFFICIENT WELDED JOINT. PRODUCES A PERFECT X-RAY, RADIOGRAPH OR GAMMA RAY PICTURE FOR HIGH TEMPERATURE SERVICES

ROBVON "C-NUB" is the PRODUCTION BACKING RING for economical welding procedure. ASSURES *positive penetration and fusion.*

ROBVON "C-NUB" *engineered-concavity* allows *root-of-weld shrinkage* eliminating ring-edge curl and crevice-pocket openings. ROBVON "C-NUB" controls WELD MASS preventing icicles.

ROBVON "C-NUB" conforms to NAVY DEPARTMENT BUREAU OF SHIPS TYPE PLAN 5000-S4800-64491-Alt. 1 and is approved by USCG, USMC, AWS, PFI, ABS and other Government Agencies.

IRON PIPE AND SPIRAL-WELD PIPE AND TUBE SIZES ¾" to 60"

"NUB" Spacer Root Openings are ⅛", 3/16" and ¼"

ROBVON furnishes 5° and 10° TAPERED Backing Rings in all metals and dimensions. ROBVON IS THE ONLY MANUFACTURER OF THE "C-NUB" TYPE BACKING RING

"C-NUB" and TAPERED in SPLIT or FABRICATED (inert-arc) SOLID

"Inert-arc Technique"—w/Argon gas
Carbon (.08) A106
1% ChrMo WP12
4-6% ChrMo WP5
35-H14 Aluminum
18-8 Stainless (Type 347Cb)
Inconel X, Monel, Incoloy, Alloy Stainless and other metals.

An economic saving in materials, the ROBVON "C-NUB" BACKING RING *SAVES* more than 50% fit-up preparation — *REDUCES* initial maintenance and replacement costs.

ROBVON "C-NUB" BACKING RINGS are CATALOGUED — STOCKED — SOLD by leading Pipe, Valve and Fitting Manufacturers and through their branches, distributors and jobbers. "STANDARDIZED" by TOP-SIDE Fabricators, Designers, Consultants, Utilities, Shipbuilders, Refiners, Industrials, Chemicals, Textiles, Boiler and Turbine Manufacturers and other diversified Users.

ROBVON BACKING RING COMPANY

GENERAL OFFICES

675 GARDEN ST., ELIZABETH, N. J.

Phone EL. 2-9613-4

IVAN S. FORDE, JR., *Sales Manager*

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BRANCH OFFICE
PITTSBURGH-OHIO VALLEY
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2241 Oliver Building, Pittsburgh 22, Pa.
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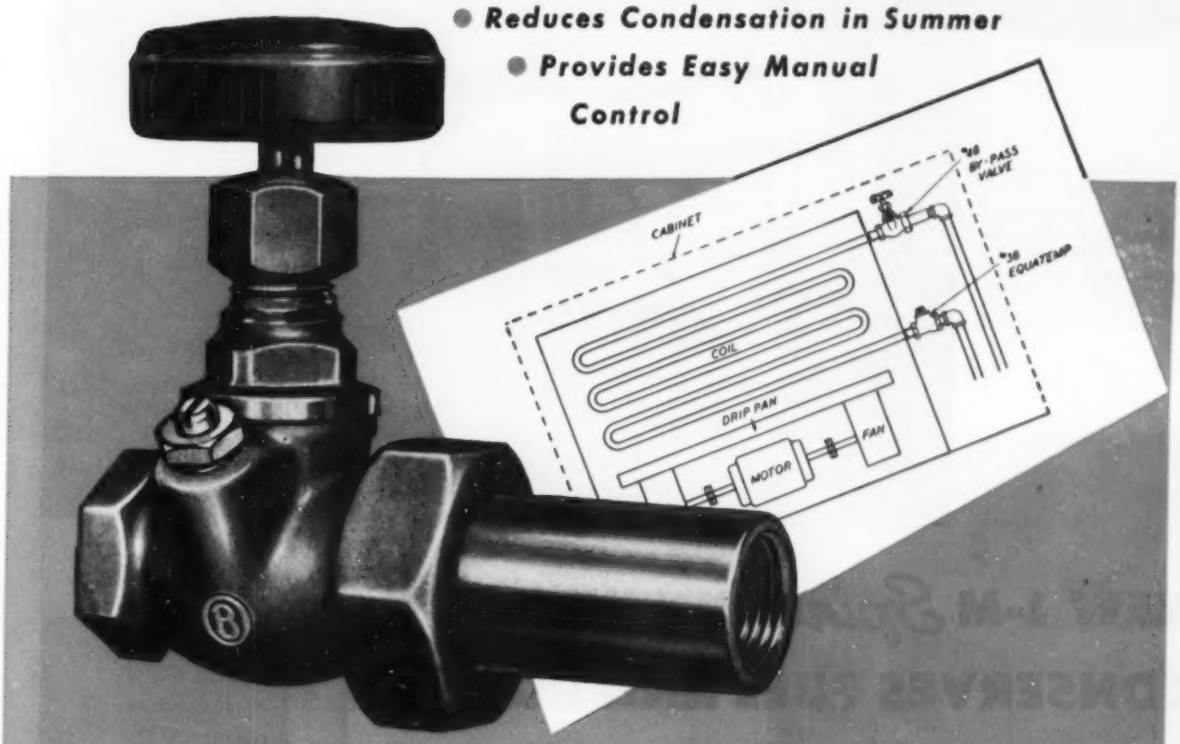
New O-B No. 48 By-Pass Valve

- *For Air Conditioning Units*
- *Prevents Freezing in Winter*
- *Reduces Condensation in Summer*
- *Provides Easy Manual Control*



This new valve is designed especially for use on room units of year-around air conditioning systems. Basically, it's a sturdy globe valve for manual control of room temperature. But probably the most important single feature is the by-pass. It remains open in winter, even with the valve closed, to allow enough circulation to prevent freezing. In summer the by-pass is closed so that no cold water can stand in the unit when it is shut off. This eliminates the danger of excess condensation.

Usual procedure is to install the No. 48 in combination with O-B Equatemp as shown in the line drawing. It can also be used separately from Equatemp®, the valve that both balances and shuts off. The combination of Equatemp and No. 48 valves offers complete temperature control, positive on-and-off regulation, balancing, and provisions for venting, draining and temperature readings. A union nut and tail piece comes with the No. 48 Valve. Send in the coupon below for a folder giving complete information.

Ohio Brass

MANSFIELD · OHIO

BRONZE GLOBES - GATES - CHECKS - ANGLES FOR INDUSTRIAL, DOMESTIC SERVICE

Ohio Brass Company
Mansfield, Ohio

Please send me the new Equatemp and No. 48 Valve folder, 1271-V.

Name .....

Company .....

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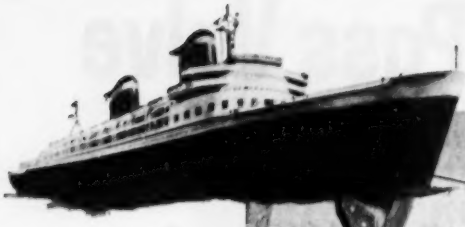
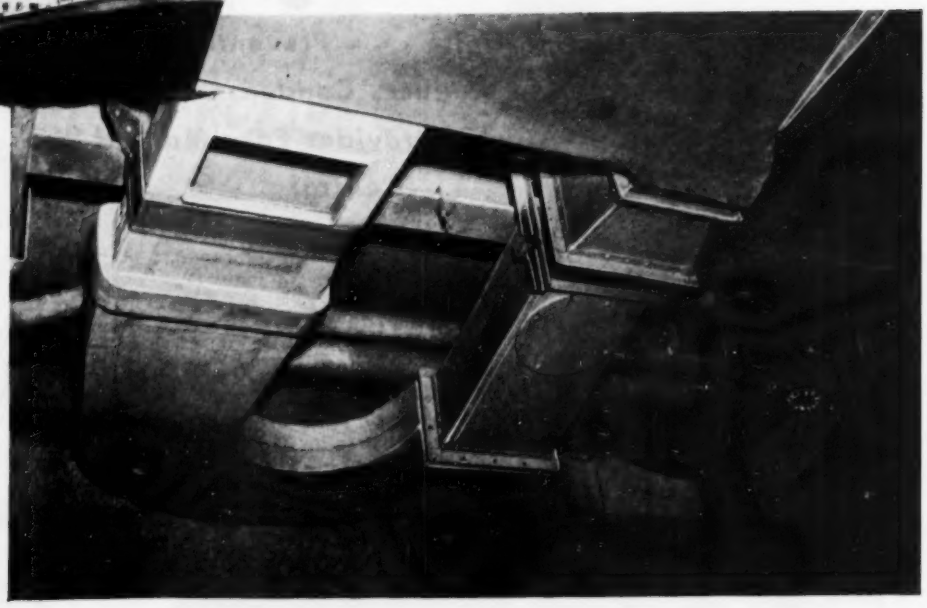
City ..... State .....

4377-V

On the air conditioning ducts aboard the S.S. United States . . .





These Spintex insulated ducts are a vital part of the 65 air conditioning systems that honeycomb the new superliner S. S. United States.

NEW J-M *Spintex* INSULATION CONSERVES FUEL AND POWER

MILES OF DUCTS . . . a vital part of the 65 air conditioning systems that honeycomb the S. S. United States . . . are insulated with Johns-Manville Spintex. This insulation was selected because it makes possible maximum passenger comfort at minimum operating cost.

Low thermal conductivity . . . plus resistance to moisture, fire, rot and mold growth . . . make Spintex the most effective insulation for guarding against heat transfer and moisture accumulation.

Spintex in flexible and semi-rigid types, plus rigid Rock Cork* and Zerolite*, form a team of Johns-Manville insulations for air conditioning ducts that meet every industrial requirement. Basically mineral products, each insulation has its particular characteristics that make it specially suitable for a specific air conditioning service. All three have the low heat transfer properties needed for high insulating efficiency. Properly installed, these insulations for air conditioning ducts will perform their function effectively for the entire life of the equipment on which they are applied.

Since proper application is so essential to the peak performance of any insulation, Johns-Manville offers industry the services of experienced installation contractors who have made a career of solving complex insulation problems.

J-M Insulation Engineers and J-M Insulation Contractors are conveniently located. They stand ready to combine their talents and give you an insulation job that will pay off your initial investment with maximum fuel savings.

Why not let us send you a free copy of Brochure IN-135A which gives all the facts about Johns-Manville Insulations for Air Conditioning Ducts? Write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U. S. Pat. Off.

Applying Johns-Manville Spintex insulation on one of the ducts aboard the S. S. United States during construction at the Newport News Shipbuilding and Dry Dock Company. Johns-Manville Insulation Contractors throughout the country know Spintex and other J-M insulations as *quality* products, and take pride in applying them properly for peak performance.

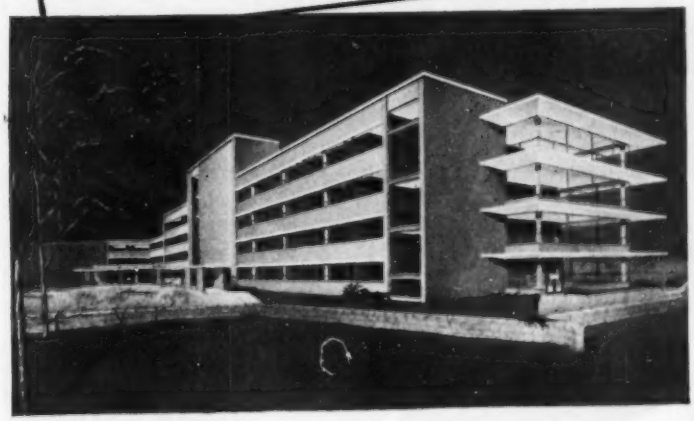
Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION

Versatile

KRITZER Fin-pipe radiation* heats any type building— ANYWHERE!

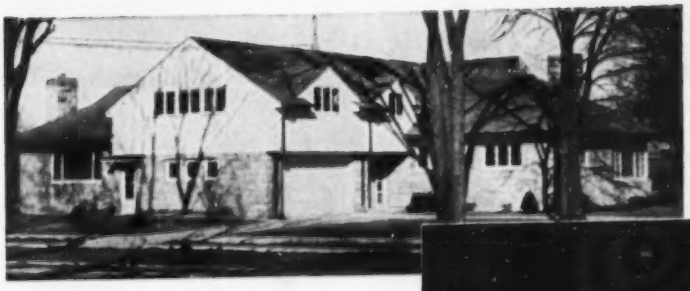
APARTMENTS



HOSPITALS

HOUSING PROJECTS

SCHOOLS

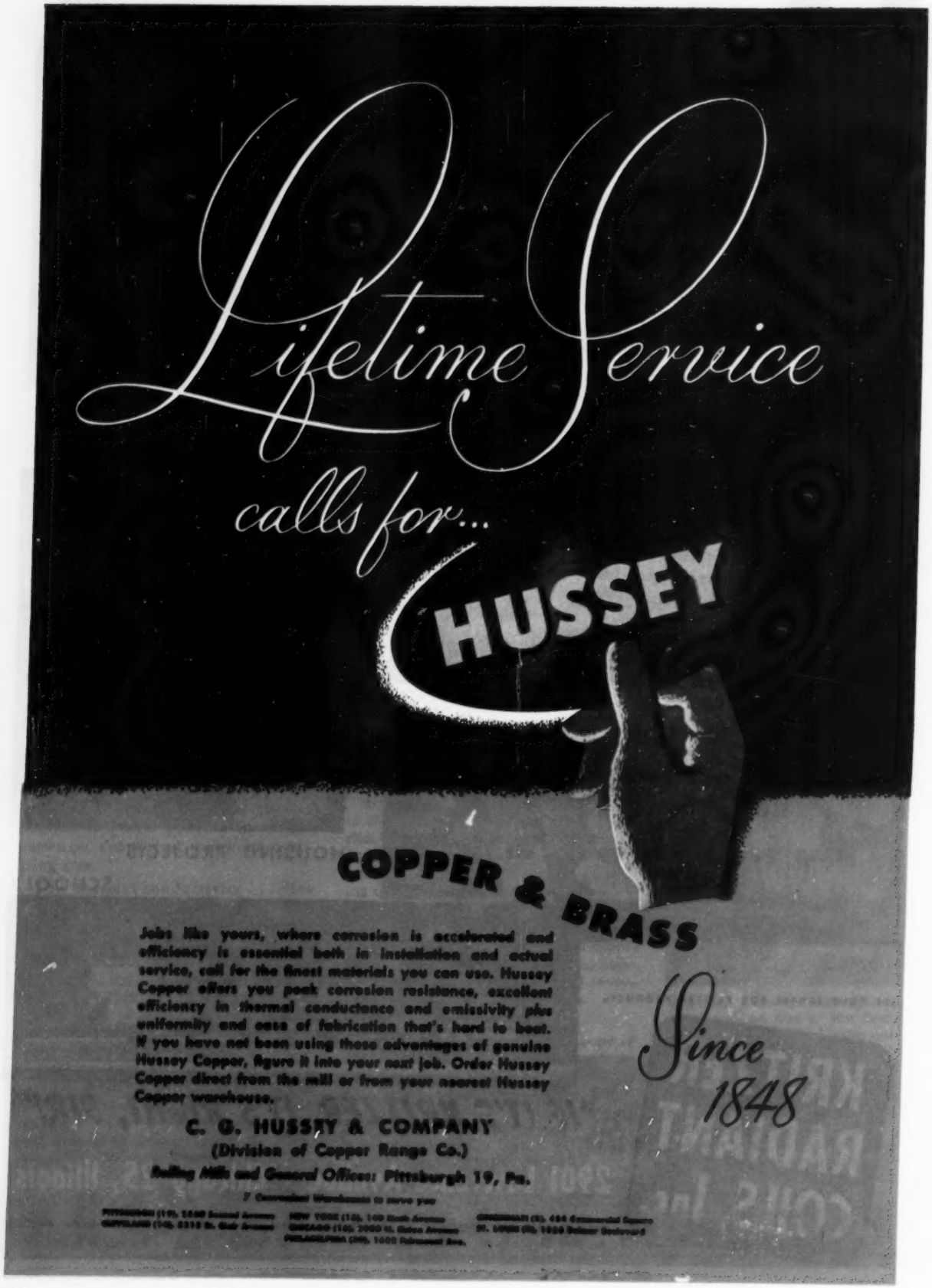


HOMES

SEE YOUR JOBBER FOR KRITZER PRODUCTS

KRITZER RADIANT COILS, Inc.

2901 Lawrence Avenue · Chicago 25, Illinois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Jobs like yours, where corrosion is accelerated and efficiency is essential both in installation and actual service, call for the finest materials you can use. Hussey Copper offers you peak corrosion resistance, excellent efficiency in thermal conductance and emissivity plus uniformity and ease of fabrication that's hard to beat. If you have not been using these advantages of genuine Hussey Copper, figure it into your next job. Order Hussey Copper direct from the mill or from your nearest Hussey Copper warehouse.
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Since 1848

"Packaged" for better firing at lower cost

factory assembled and tested

This Iron Fireman firing unit is much more than just a burner. It's a complete combustion system, including burner, automatic controls, fuel system and forced draft air supply integrated into a single balanced package unit. It is readily applied to Scotch marine or other types of high or low pressure boilers by bolting to the boiler front.

To the user this means an attractive saving in installation time and cost. But even more important, it means a factory assembled and tested unit instead of a locally assembled job. It means dependable performance and high operating efficiency, with substantial fuel savings. It's the *smart* way to modernize your boiler room.

See your Iron Fireman dealer or write for further information to Iron Fireman Manufacturing Company, 3068 West 106th Street, Cleveland 11, Ohio. In Canada, write 80 Ward St., Toronto, Ontario.

1. Assembled and tested at factory instead of on the job.
2. Applicable to practically all types of boilers.
3. Continuous high combustion efficiency.
4. No high stack—requires only vent pipe.
5. For either gas or oil firing. Combination burners quickly shifted from one fuel to the other.
6. Burns low-cost heavy oils (No. 6 or any lighter grade).

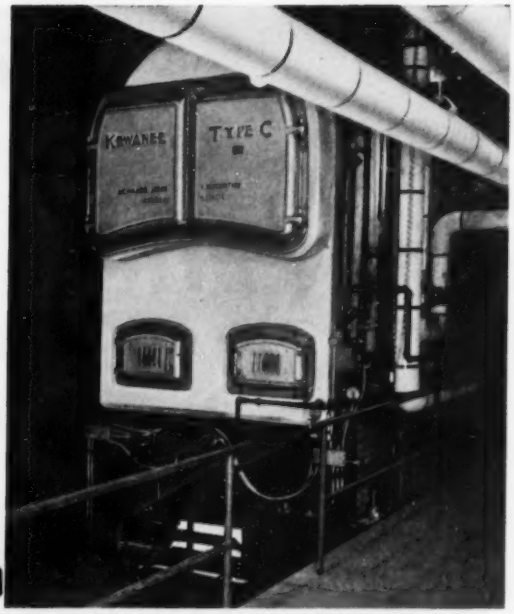
Iron Fireman

Gas, Oil, Coal firing equipment for heating, processing, power

MORE ENGINEERING MORE MATERIAL MORE EXPERIENCE

MAKE THE DIFFERENCE

KEWANEE STEEL BOILERS



One of a Battery of Type "C" Kewanees in The Hecht Company Store, Arlington, Va.

84 years experience in designing and building steel boilers provides an accumulated knowledge sure to result in boilers of unusual economy and dependability.

More material and labor also play their part in making Kewanee Boilers different and better. "Skimp" on steel and the boiler can't be big enough to do its job . . . use lighter weight plate and strength and durability are reduced. More goes into Kewanee Boilers, so the owners get more from them. That's why they are universal favorites for generating dependable, economical heat or power.

In designing and equipping their "Parkington" store, The Hecht Company applied its vast retailing experience to provide the utmost in shopping convenience and comfort. Modern features include 127 complete departments; air conditioning; high speed elevators and motor stairs; fluorescent lighting; accoustical ceilings . . . and for the important job of heating . . . Kewanee Boilers.

KEWANEE-ROSS CORPORATION
Division of American Radiator & Standard Sanitary Corporation
KEWANEE, ILLINOIS

THE HECHT COMPANY, Store
Arlington, Virginia
Design of entire project, under direction of
ABBOTT, MERKT & CO., Engineers, New York
KAHN & JACOBS, Associate Architects
EDWARD E. ASHLEY, Associate Engineer
Oil Fired Kewanee Boilers installed by
R. M. THORNTON, Washington, D. C.

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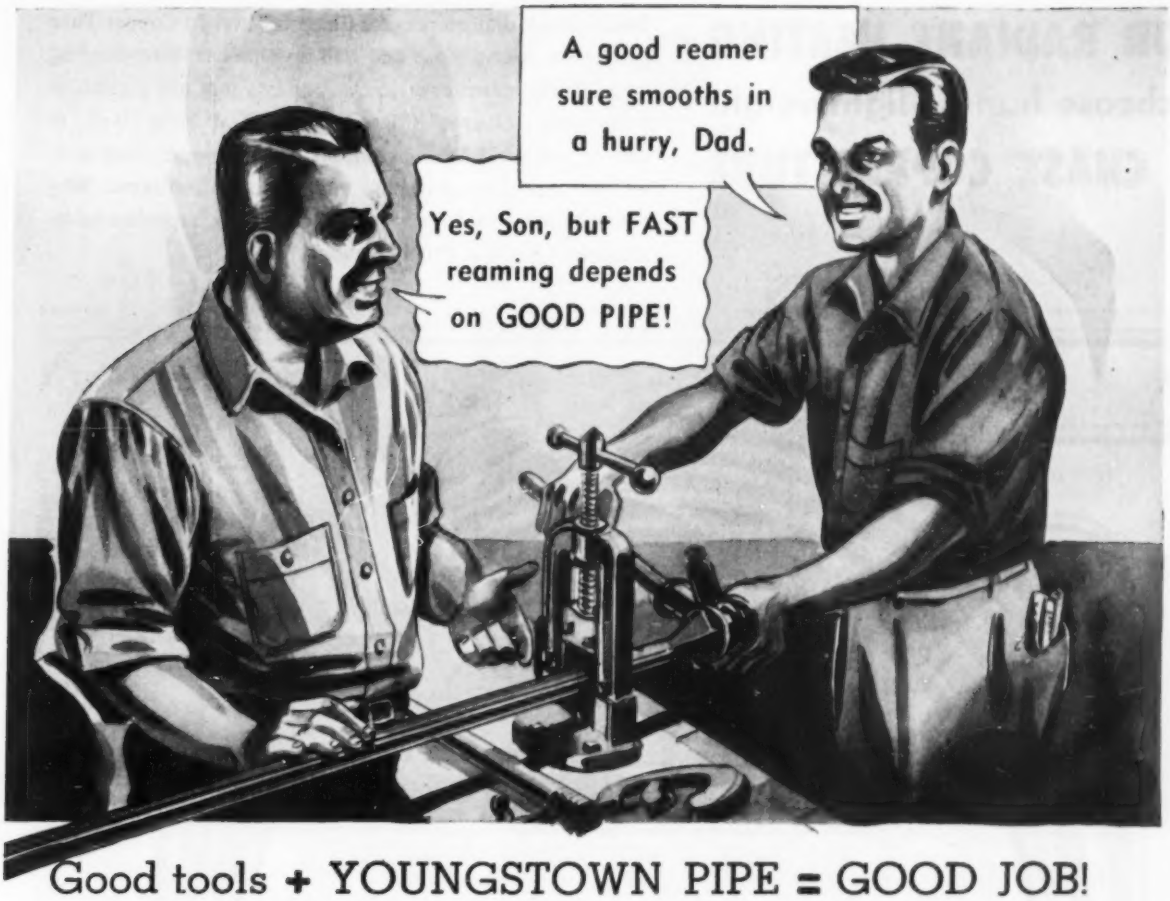
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



Good tools + YOUNGSTOWN PIPE = GOOD JOB!

● You really speed along when you work with Youngstown pipe. Reaming is easy and fast because Youngstown Steel Pipe produces a minimum of burrs in cutting. This is because Youngstown is quality steel, chemically and metallurgically right, controlled by one producer—Youngstown—from raw ore to finished product. The name Youngstown, rolled into every length, means GOOD PIPE.

7 POINTS OF UNIFORM GOODNESS IN YOUNGSTOWN STEEL PIPE

UNIFORM

- ductility
- lengths
- threading
- weldability
- wall thickness and size
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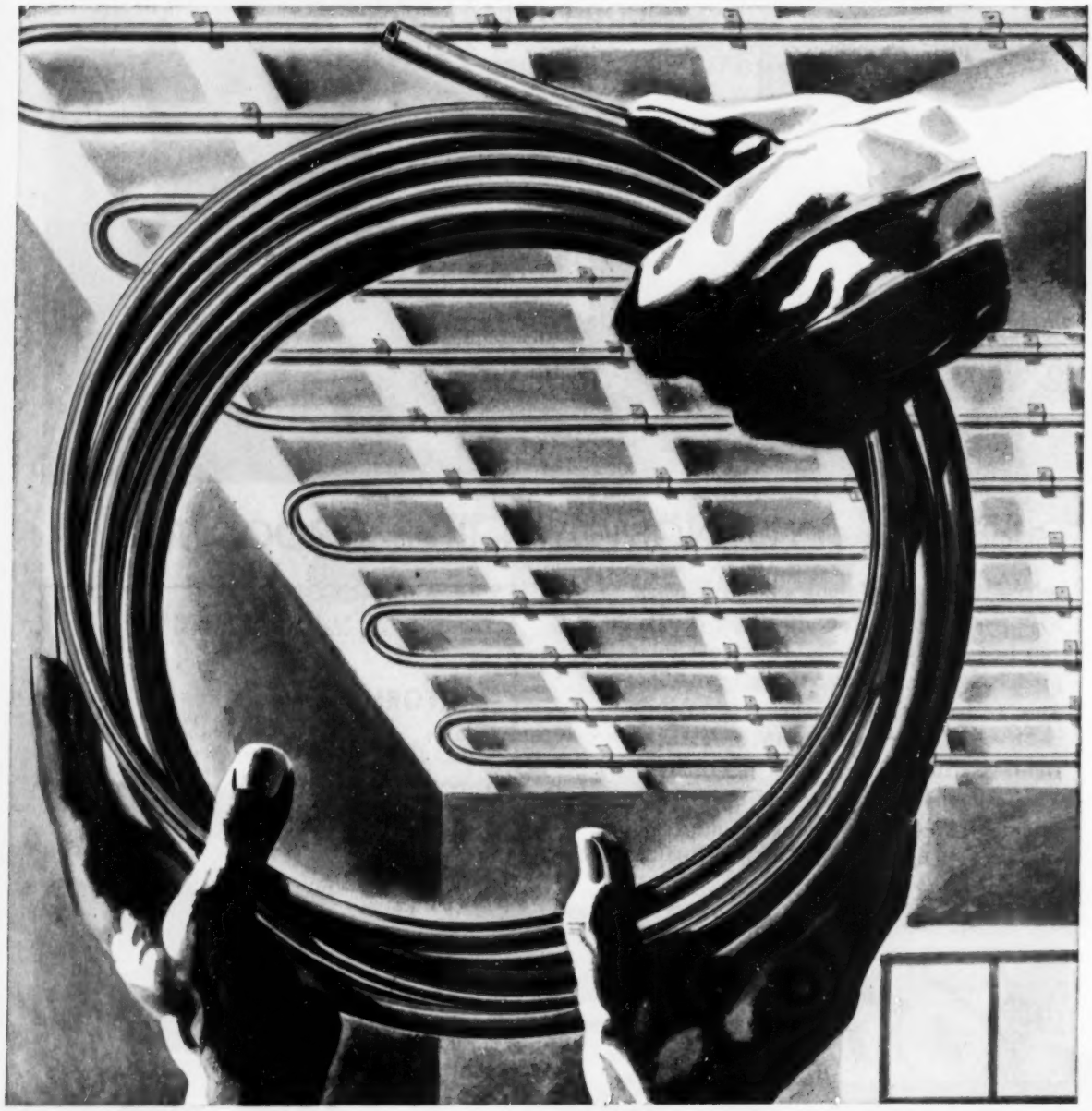
CHASE® COPPER TUBE

Small outside diameters make Chase lightweight Copper Tube perfect for ceiling, floor and wall installations. Easy-bending long lengths mean fewer joints . . . joints that are a cinch to make with leak-proof Chase Solder-Joint Fittings. And, of course, you get all the superior qualities of Copper: long service, excellent thermal conductivity, corrosion resistance. Why not write today for Free 50-page Book giving important information on Radiant Panel Heating!



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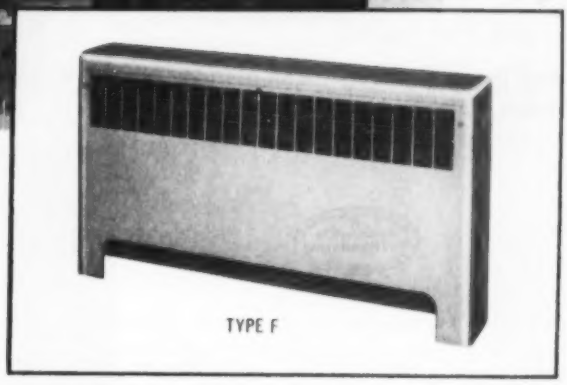

TYPE F

740 ULTRA-MODERN LIVING UNITS COMFORTABLY HEATED

By *Airtherm* CONVECTORS

The clean, modern beauty of Airtherm Convectors fits perfectly into these functional interiors. Outstanding performance and easy maintenance make Airtherm Convectors exceptionally practical for this huge apartment project. To help you solve a wide range of heating problems Airtherm Convectors are available for wall, recessed or free-standing installation.

For Heating Satisfaction . . .
Think First of
Airtherm

Oil or Gas Direct Fired Heaters

Horizontal Type Unit Heaters

Vertical Type Unit Heaters

Centrifugal Fan Unit Heaters

Ask Your Wholesaler or Write

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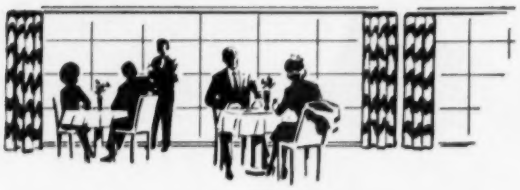


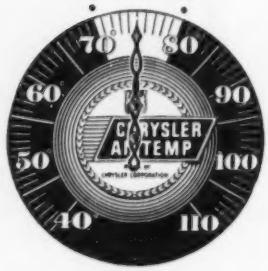
OVERCOME WATER PROBLEMS WITH *NEW* AIR-COOLED AIR CONDITIONER!

Chrysler Airtemp has the answer for air conditioning jobs where water is hard to get . . . where distance makes piping costs prohibitive . . . where water pressure is low . . . or where the water is very hard or corrosive. It's the new Chrysler Airtemp Air-Cooled "Packaged" Air Conditioner! But that's only a few of the advantages!

- Since Chrysler Airtemp Air-Cooled "Packaged" Air Conditioner *doesn't use water* . . . it costs less to install!
- The new, small-space Chrysler Airtemp compressor is light in weight and so quiet it can be located inside the conditioned area. It's efficient and dependable.
- The new Air-Cooled "Packaged" Air Conditioner is available in 2 and 3 h.p. capacity.

Send the coupon today for all the facts. Sell the "Packaged" Air Conditioning most people buy . . . Chrysler Airtemp!

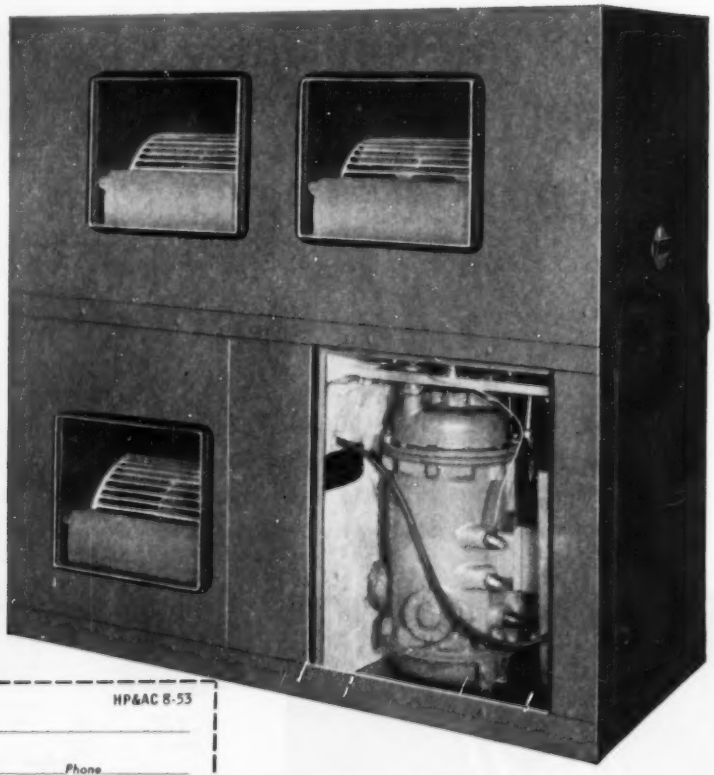
Comfort Zone FOR PROFIT



Guaranteed by Good Housekeeping

Chrysler Airtemp

HEATING • AIR CONDITIONING
***for* HOMES, BUSINESS, INDUSTRY**
Airtemp Division, Chrysler Corporation
Dayton 1, Ohio



New Air-Cooled 3 H. P. "Packaged" Air Conditioner

HP&AC 8-53

Airtemp Division
Chrysler Corporation
P.O. Box 1037
Dayton 1, Ohio

Please send full details on the Chrysler Airtemp Comfort Zone "Packaged" Air Conditioning proposition.

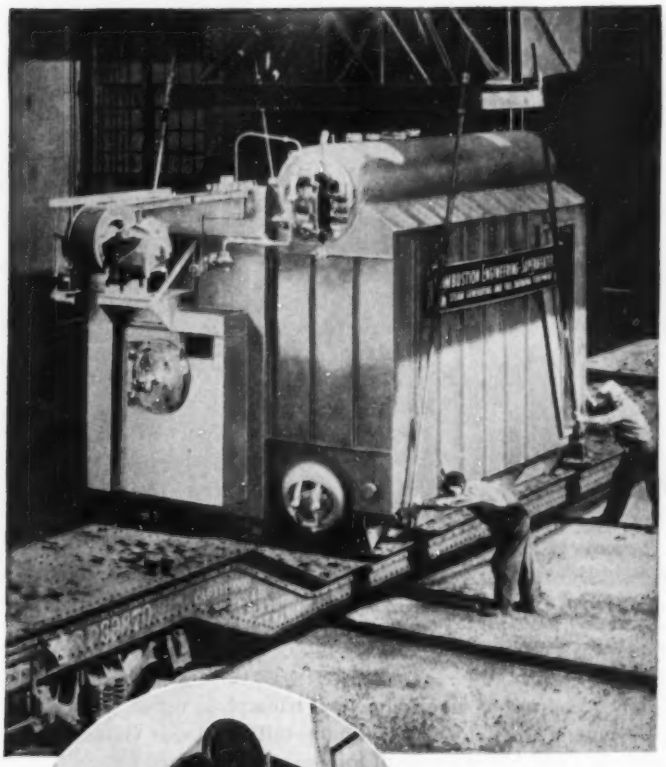
Name_____

Address_____ Phone_____

City_____ Zone____ State_____

Don't settle for just A Package Boiler

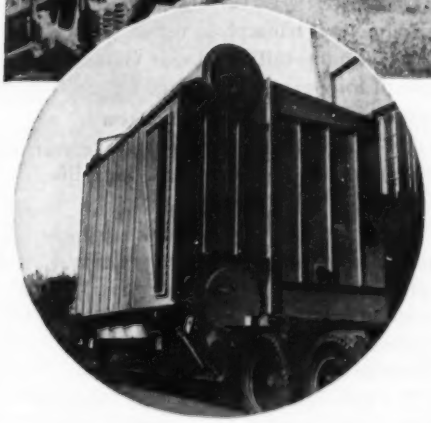
INVESTIGATE THE VP BOILER



...the Package Boiler with EXTRA features

If you're in the market for a Package Boiler, here's the problem you face. There are a number of water-tube package boilers being offered today. Most of them look pretty much alike. And, in some respects, they *are* alike.

But you're looking for the "best buy" in a package boiler. Therefore your interest lies in points of difference rather than points of similarity. The C-E Package Boiler, Type VP, offers all the better design features of its contemporaries *plus* the following extra features:



VP Boilers are available in capacities from 4,000 to 30,000 lb of steam per hr; pressures to 250 psi. Send for Bulletin VP- 182.

1. **Fully Water Cooled Furnace**—More cooling area per cubic foot of furnace volume than any other boiler of the VP's size and type. In all but the three smallest sizes, the VP Boiler has water-cooled walls on *all six sides* of the furnace—including the burner wall.

2. **Larger Lower Drum**—The 30-in. diameter lower drum permits a simple, symmetrical tube arrangement . . . provides easy access for washing down or inspection . . . its greater water storage capacity facilitates the handling of fluctuating loads.

3. **Centrifugal Fan**—This more efficient type of fan operates at lower speed than other types and is quiet in operation. In fact, its average noise level is less than half that of typical high-speed fans used on most package boilers.

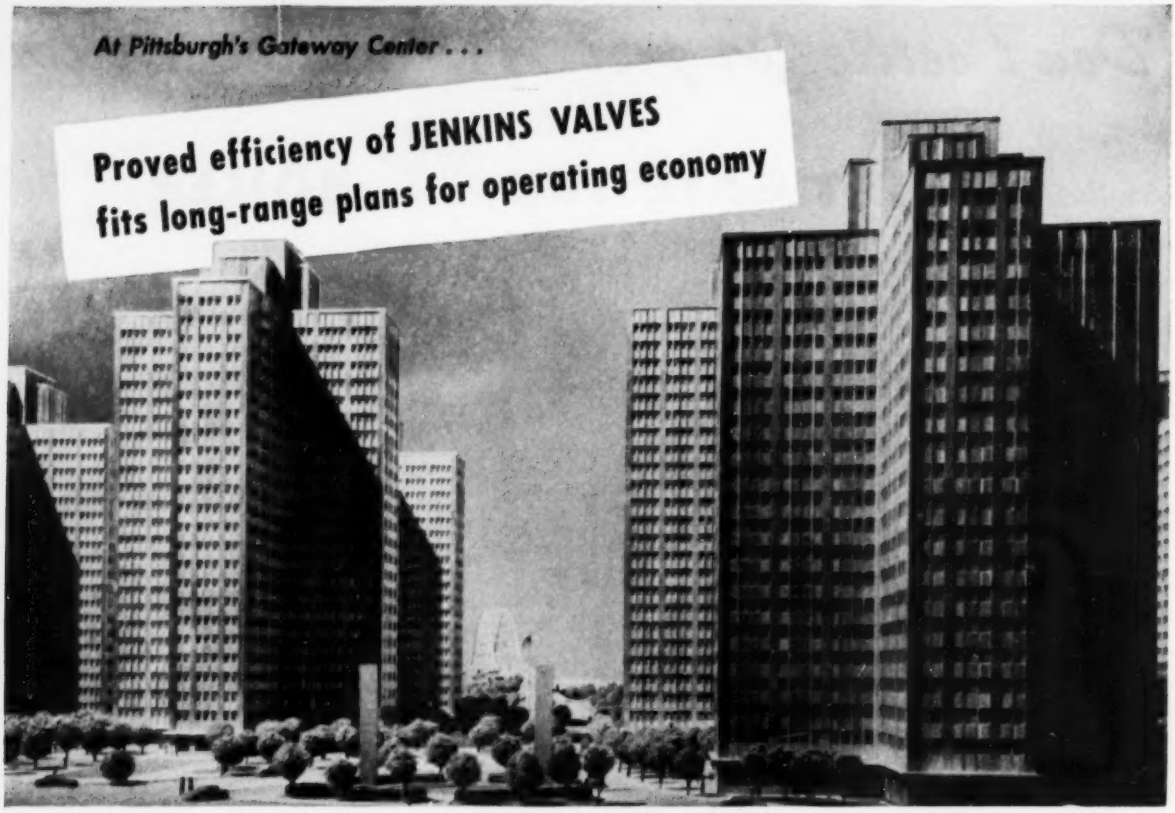
4. **Simple Baffle Arrangement**—Minimum changes in direction of gas flow—no baffle at all in convection bank of larger VP Boilers. This means lower draft loss . . . simplified soot blowing . . . absence of dead pockets, thus, maximum heat pick-up. In the intermediate sizes, a water-cooled baffle assures minimum maintenance.

B-6738

COMBUSTION ENGINEERING Inc.

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS



Architects: IRWIN CLAVAN, N. Y. and EGGERS & HIGGINS, N. Y. *Owner:* THE EQUITABLE LIFE ASSURANCE SOCIETY OF THE UNITED STATES *General Contractors:* STARRETT BROTHERS & EKEN, INC., N. Y. *Heating, Ventilating, and Air Conditioning Contractor:* KERBY SAUNDERS, INC., N. Y. *Plumbing Contractor:* C. H. CRONIN, INC., N. Y. *Mechanical Engineers:* MEYER, STRONG & JONES, N. Y.

At Gateway Center, this section of the air conditioning system contrasts the wide size range of the many thousands of Jenkins Valves installed. Above right, is a large Iron Gate with a 90° offset handwheel. To the left is another large Iron Gate, motor-operated. Below at left and right are small Bronze Gates controlling water lines to pressure gauges.

Widely acclaimed as an architectural triumph in urban redevelopment, Pittsburgh's giant multi-million dollar Gateway Center is a notable example of long-range planning.

With over 36 miles of pipelines, and one of the largest air-conditioning systems ever assembled in one operation, it was imperative that all components be selected for long life and trouble-free performance. With this objective, Jenkins Valves were installed.

Careful comparison has led to repeated choice of Jenkins Valves by the men who plan and erect the buildings that "make news" throughout the nation. They know Jenkins builds extra endurance into valves — proved by low upkeep cost records in every type of service. Despite this extra value, you pay no more for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17. Jenkins Bros., Ltd., Montreal.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.

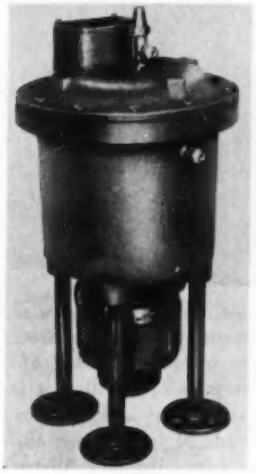
SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

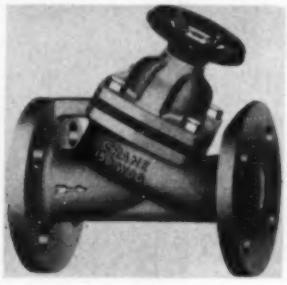
EQUIPMENT DEVELOPMENTS...

Add the new products and companies listed here to your Directory Section which you received in your January 1953 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section: double asterisk, equipment and manufacturer not listed.

Packless Diaphragm Valve

Diaphragm valve with diaphragm and disc construction . . . . Since the diaphragm is not used for seating, it is not subjected to the cutting, crushing and abrasion that lead to rapid wear. According to the manufacturer, closure of the independent disc will prevent escape of line fluids even if the diaphragm should fail. Specially prepared valves for vacuum, oxygen and acetylene services are also available. [Manufacturer: Crane Co., 836 S. Michigan Ave., Chicago 5.]





Above: Packless Diaphragm Valve

Left: Hermetic Refrigerant Pump

Hermetic Refrigerant Pump

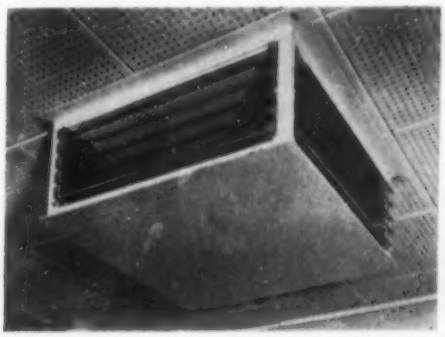
**Hermetically sealed pump to handle "Freon" refrigerants in their liquid state. . . .It may be used with single or multiple circuit "Freon" evaporators. Heat transfer is increased by pumping liquid refrigerant in excess of evaporation requirements. A patented oil return automatically holds the oil concentration in evaporators to a minimum. According to the company, the pump speeds temperature adjustment by eliminating thermal expansion valves. Varying temperatures are secured by the use of thermostatically controlled solenoid valves on individual evaporators. [Manufacturer: Heatron Inc., 333 Eberts Lane, York, Pa.]

Gas Burner

Gas-fired retention line burner for applications where heat must be distributed over a wide area by a continuous flame . . . . The burner is of blast burner design and may be installed to fire in any direction. According to the manufacturer, drilled ports and steel retention lips provide flame stability. The new burner is said to be excellent for oven heating, kettle heating and air heating installations, including make up air systems for spray booths. [Manufacturer: Eclipse Fuel Engineering Co., 1139 Buchanan St., Rockford, Ill.]

Diffuser for Evaporative Coolers

**Evaporative cooler diffuser for ceiling installation. . . .It is made in three models to fit all duct sizes for roof mounted evaporative coolers up to 6500 cfm. Aluminum painted louvers are reversible if "non-vision"



appearance is desired. According to the manufacturer, one screw at each corner is all that is required for installation. A sliding damper panel may be inserted during the winter to block off drafts. [Manufacturer: Ashburn Supply Co., 8468 Warner Dr., Culver City, Calif.]

Close Coupled Pump

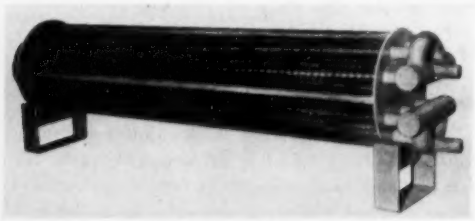
"CC" series pump for cooling towers, air conditioning, chilled water circulating, hot water circulating, pneumatic water systems and booster systems. . . .The pump is equipped with a mechanical seal consisting of a fixed-in-place carbon ring on a ceramic seat designed to be resistant to wear and corrosion. The 3500 rpm motor is of the repulsion induction type. The enclosed bronze impeller is the single suction type keyed

to the shaft and secured with a lock nut. [Manufacturer: Chicago Pump Co., Building and Industrial Div., 622 Diversey Pkwy., Chicago 14.]

Tank Heaters

**"Cal-Fin" tank heater features helically wound serrated fins which are designed to combat laminar flow. . . . According to the company, fabrication of the new tank heater was made possible by the development of

finning equipment capable of helically winding and continuously welding serrated stainless or carbon steel fins to stainless or carbon steel tubes. Available in two basic designs, the "Series IH" heaters are designed for complete



submergence in the fluid to be heated. The "Series MH" is designed for installation in a manhole. [Manufacturer: Drayer-Hanson, Inc., 3301 Medford St., Los Angeles.]

Liquid Level Control for Refrigerants

"Level-Master Control" used with a thermostatic expansion valve for flooded refrigeration systems. . . .The liquid level control, for use with ammonia, "Freon-12" and "Freon-22,"contains an insert bulb which can be installed in either a horizontal, vertical or angle position for direct contact with the refrigerant. If the liquid level drops, a heater element in the bulb acts as an artificial superheat increasing the pressure in the thermostatic element, thus opening the valve. If the liquid level rises, its refrigerating effect on the bulb overcomes the heater and the valve throttles. [Manufacturer: Sporlan Valve Co., 7525 Sussex Ave., St. Louis 17, Mo.]

Above: Butterfly Valve
Right: Control

Butterfly Valve with Resilient Seat

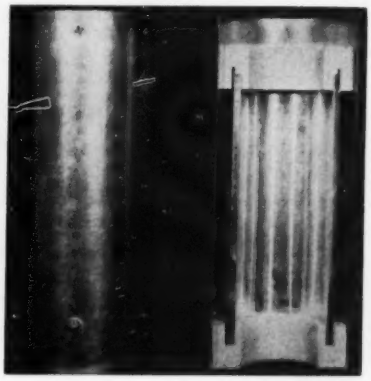
**Butterfly valve for low pressure service with resilient neoprene seat. . . .The sealing element effects a shut-off against pressure or vacuum especially where sand or other solids are present in the stream. The resilient seal ring exerts positive pressure against the butterfly disk when the valve is closed. The valves can be mounted between standard flanges, and are available with various end fittings having screw ends, welding ends or flanged ends, or a combination of end connections. The valves are designed for operating pressures up to 150 psi and range in size from 2 through 12 in. [Manufacturer: Keystone Tool Corp., P.O. Box 6716, Houston 5, Texas.]

Oiler for Refrigeration Compressors

**Oiler for refrigeration compressors and units permits re-oiling without shutting down machinery. . . .The "Pressure-Speed" oiler is connected to the oil valve so that the use of a funnel is not necessary. The top cover of the oiler is held down by four wing nuts. The opening in the top of the container measures approximately 2 in. All connections to the oiler are located above the oil level so that entrained oil will not flow out by gravity when disconnecting the oil feeder lines. According to the manufacturer, this device eliminates the hazard of permitting air, moisture or other foreign matter to enter the machine. [Manufacturer: Refrigeration Devices Co., P. O. Box 108, Nutley, N. J.]

Reflective Insulation for Pipe

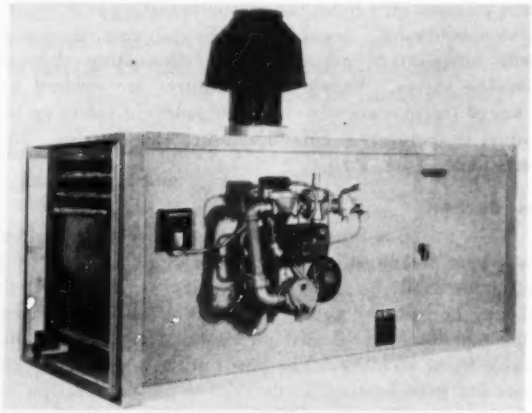
**Reflective insulation for pipe coverings, valve and fitting covers which can be removed and put back without damage . . . . According to the manufacturer, the inherent reflector design throws the heat around entire line



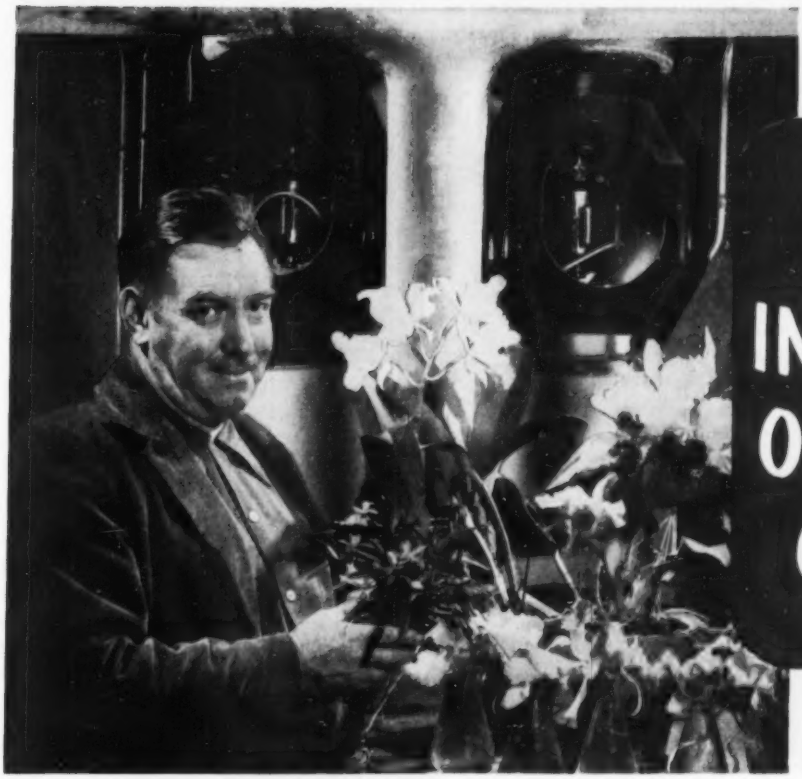
for anti-freeze protection and in the case of electric wire tracers, no increase in pipe insulation size is required. The company also states that the insulation is not absorbent and not sensitive to water penetration, that it is fireproof, will withstand thermal shock and is dimensionally stable. The outer sheet is made of heavy gage aluminum alloy. [Manufacturer: Hunter Mfg. Co., Mirror Insulation Div., Bristol, Pa.]

Gas-Fired Suspended Furnace

Gas-fired 450,000 Btu input warm air suspension furnace featuring an electronically controlled power burner. . . .A stainless steel combustion chamber distributes the flames throughout the heater body to



effect maximum heat transfer. The electronically controlled power burner is designed to provide a more pos-



LIFE INSURANCE ON 10,000 ORCHIDS

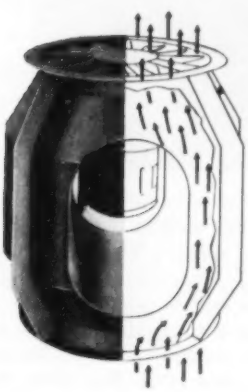
Orchid grower Walton Riffe, owner of Walton's Greenhouse, Dayton, Ohio, with some of his rare specimens. The two DeBothezat Induced Draft Bifurcator Fans in the background are mounted in the boiler breeching. Each fan serves two boilers.

A sudden drop in temperature can put an orchid grower out of business overnight. That's why Walton Riffe installed an automatic heating plant, complete with stand-by boilers, in his greenhouses.

To be sure of adequate boiler draft at all times, this famous grower mounted two DeBothezat Induced Draft Bifurcator Fans in the breeching. Now, Mr. Riffe doesn't worry. Dependable DeBothezat Induced Draft Bifurcator Fans produce a positive controlled draft that helps his system to maintain tropical temperatures regardless of weather.

Remember DeBothezat Induced Draft Bifurcator Fans the next time you have a stack problem. These fans provide a constant, controlled draft for boilers and furnaces at all times. They permit boilers to operate at maximum efficiency under any load, regardless of weather. And the cost of an Induced Draft Bifurcator Fan is usually only a fraction of the cost of erecting an old-fashioned brick or steel stack.

Ask your DeBothezat representative — you'll find him listed in the phone book under "Ventilating Equipment" — or write our factory, Dept. HP-853, for illustrated catalog DB-32-52.



HOW BIFURCATOR WORKS

The Induced Draft Bifurcator is a motor driven axial-flow fan in a divided housing. Motor is in an isolated chamber around which flue gases are by-passed (bifurcated) so that the motor always remains cool, clean and accessible. Induced Draft Bifurcators are built in twenty-four sizes, for high pressure boilers delivering up to 60,000 pounds of steam per hour and for low pressure boilers rated up to 190,000 EDR.

DeBothezat Fans

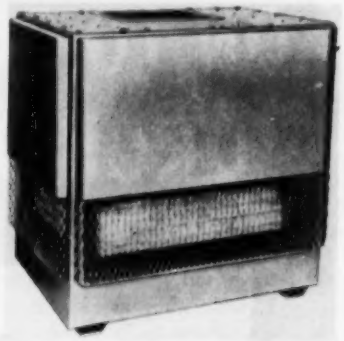
Division of American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

itive air mixture and better operating efficiency. Electric eye protection is included to enhance safe operation by automatically shutting the burner if the fuel is curtailed for any reason. The furnaces are designed for 4600 cfm of air replacement at bonnet and 3900 standard. A 15-in. blower and 1 hp, 1750 rpm motor are used. [Manufacturer: Jackson & Church Co., 321 N. Hamilton, Saginaw 65, Mich.]

Cooling Towers for Air Conditioning

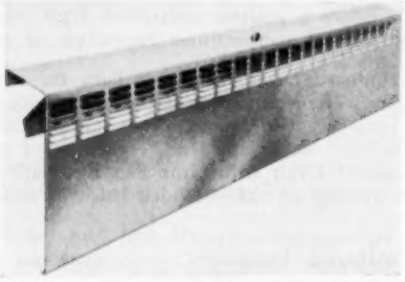
**Six new models of "Therm-O-Jector" packaged cooling towers for 3, 5, 7½, 10, 12½ and 15 ton capacity . . . . According to the manufacturer, the towers are built with gravity flow to assure quiet operation. A three-directional water distribution trough is designed to eliminate the necessity for a sprayer. One motor operates



the centrifugal blower. The motor and pump are mounted in an enclosed compartment to protect them from moisture. All piping and electrical connections are located on one side near the base. [Manufacturer: Imsco Mfg. Co., 4215-A Gaston Ave., Dallas.]

Enclosure for Baseboard Radiation

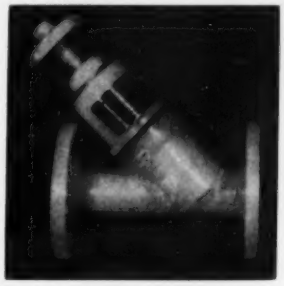
Style "KS" enclosure designed to provide a baseboard-type enclosure for commercial and industrial installations . . . .The front and top are one piece and the unit is mounted on a full metal backing. Outline louvers are in the front skirt so that convection currents are directed away from the wall to improve temperature distri-



bution. Radiator elements are hung from the backing by means of the company's patented rod-type hangers. The enclosures can be furnished in lengths of 3 in. increments up to a maximum of 8 ft in one piece. A full line of accessories is available. [Manufacturer: Vulcan Radiator Co., 16 Francis Ave., Hartford, Conn.]

Corrosion Resistant Plastic Valves

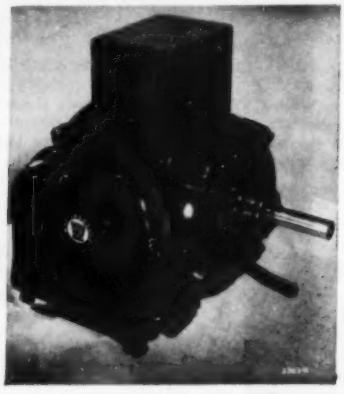
*Corrosion resistant plastic globe and "Y" valves. . . .They are constructed entirely of polyethylene except for the sealing diaphragm on the disc which is composed of a polyethylene-polyisobutylene mixture to insure maximum resilience and drop tightness. The valves are designed to withstand the corrosive action of most



acids and caustic solutions. They are recommended for working pressures up to 50 psi and temperatures to 150 F. At this time, ½, 1, 1½ and 2 in. sizes are available, with larger sizes soon to be announced. [Manufacturer: The Vanton Pump Corp., Empire State Bldg., New York.]

Single-Phase Motor

Single-phase motor of capacitor-start and capacitor run type . . . . Called the type "CAP-2," the motor is made in 5, 7½ and 10 hp ratings. The company states that capacitor-run motors reduces the starter current about 25 percent. The auxiliary winding remains in the circuit

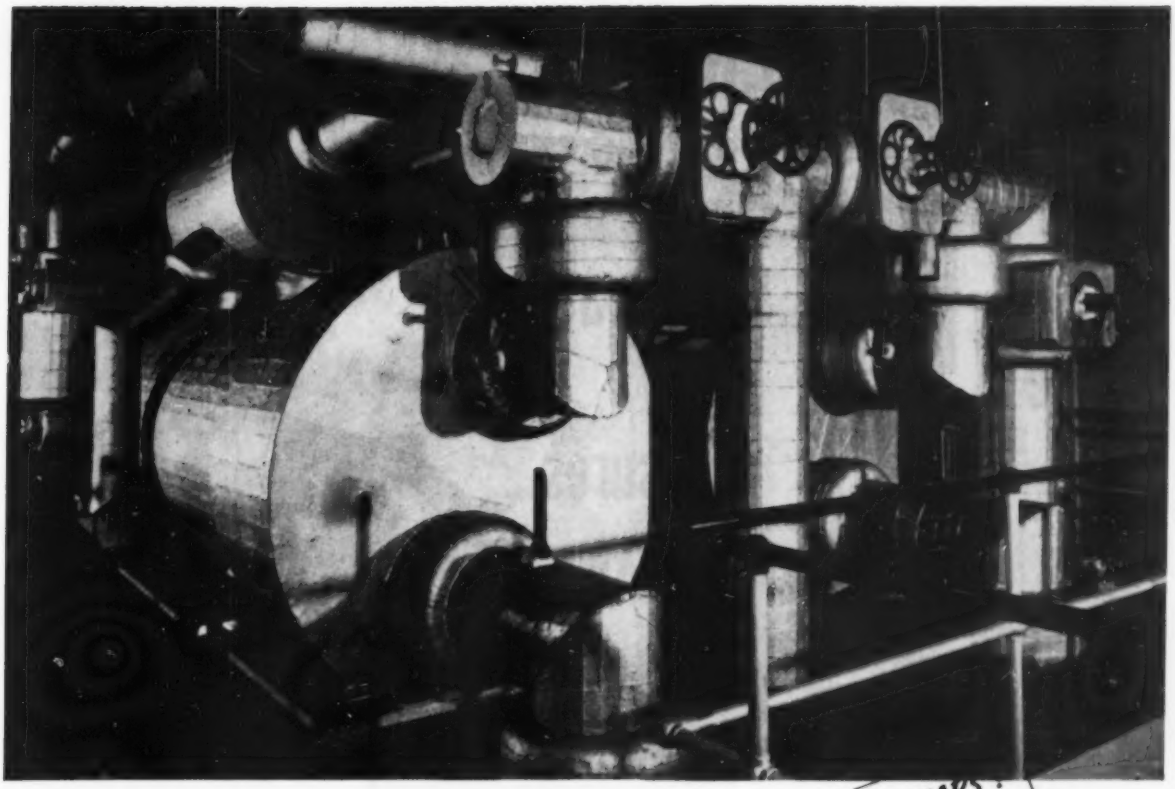


during operation and is in series with the running capacitors. Relays remove the starting capacitors when the motor approaches full speed. The main winding is directly across the line. Where three-phase power is not available, this design is said to permit the use of larger single-phase motors for such applications as air conditioning units, oil well pumping, etc. [Manufacturer: Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30.]

Pressure Relief Valves

Two new larger size pressure relief valves for use on hot water space heating boilers. . . .These valves are larger versions of the company's No. 230 valve and are listed as the 1-in. No. 230 and the 1½ in. No. 230. They are designed for hot water boilers with heat outputs to 743,000 Btu per hr and 1,025,000 Btu per hr, respectively. All valves are designed to open at 30 lb pressure. Pressure settings are established at the factory. The valve seat is made of brass and the valve disc

[*Continued on page* 189]



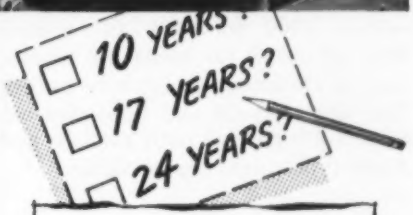
How long has cork helped hold these brine tanks at minus 12°?

Here are brine coolers and lines that were insulated with cork lagging and corkboard back in 1929. Today, 24 years later, the insulation looks as good as new.

This installation is at the Consolidated Gas Company's warehouse in Baltimore, Md. Operating temperatures range from − 12° to − 20° F. The tanks and lines were insulated with Armstrong's Cork Lagging and Corkboard. The cork is still dry, tight fitting and needs no repairs. It is performing as efficiently as when it was first applied. During the past 24 years, the only maintenance required has been an annual coating of aluminum paint.

There's nothing unusual about the life of this job. There are hundreds of cork installations of all types that are still giving excellent service after 20, 30, and even 40 years. They have proved that properly applied cork will last a long, long time.

Call in Armstrong whenever you need low-temperature insulation. Armstrong's contracting organization can take over the entire job from correct specifications to proper installation. You get a thoroughly professional job that assures years of high efficiency, low maintenance service. For more information on this complete service, call your near-by Armstrong office or write Armstrong Cork Company, 2108 Sherman St., Lancaster, Pa.



Complete Insulation Contract Service

There are many factors that can't be written into an insulation contract, but which can largely determine whether or not the agreement will be entirely satisfactory. They include:

1. Financial responsibility—resources to complete the contract despite any unforeseen events.
2. Integrity—a reputation for quality work and for prompt settlement of any justified complaints.
3. Technical ability — experience, plus technical and research staff to do the job in accordance with best practices.
4. Manpower resources — trained supervisors and workmen able to handle any contract efficiently.
5. Efficiency — ability to deal with problems of accounting, tax provisions, insurance, and workmen's compensation.

You get all these with an Armstrong Contract

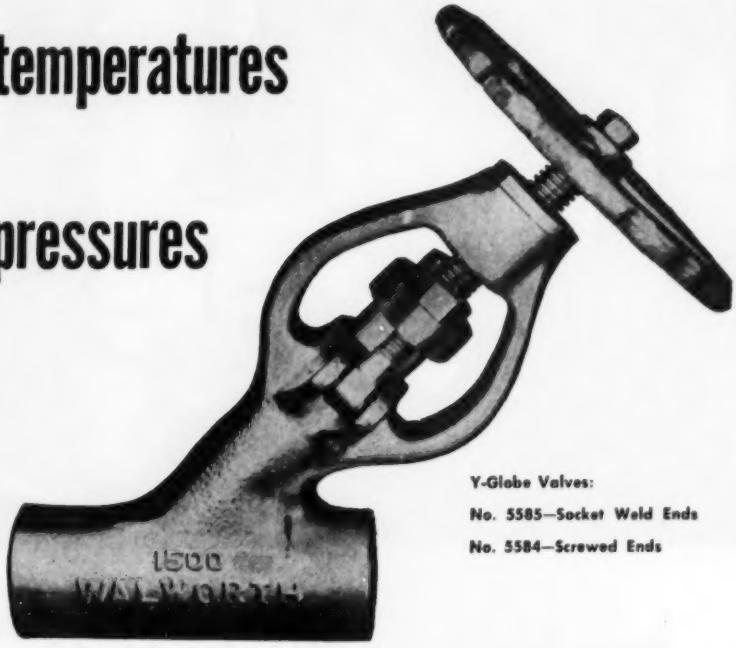
ARMSTRONG'S INDUSTRIAL INSULATIONS

For temperatures from 300° below zero to 2800° F.

Walworth's NEW small cast steel valves

SERIES 1500 – SIZES ¼ to 2 inches

handle { HIGH temperatures / HIGH pressures



Y-Globe Valves:
No. 5585—Socket Weld Ends
No. 5584—Screwed Ends

Walworth is proud to make these new Small Cast Steel Valves available to power stations . . . oil refineries . . . ships . . . wherever piping is subject to severe pressures and temperatures. Non-shock service ratings of these valves: 1500 psi–950F for steam; 3600 psi–100F for water, oil or gas. Cast of chromium molybdenum steel, they are compact and light, yet exceptionally strong. Both Y-Globe and Angle type valves are available.

Angle Valves:
No. 5587—
Socket Weld End
No. 5586—
Screwed End

Simplified Walworth design eliminates many of the valve problems encountered in high pressure service. Among the features of this new valve are:

INTEGRAL BODY AND YOKE – made from a single casting without threading or welding. Bonnet joint — always a potential source of leakage — is eliminated. Valves can be reassembled quickly and easily.

ROTATING DISC – prevents valve seat distortion and consequent leakage. Cuts down replacements.

WELDED SEAT RING – compensates for changes in pressure and temperature—eliminates a major source of leakage.

SPECIAL BACK SEAT BUSHING – permits repacking the valve under pressure with greater safety.

PACKING CHAMBER – designed to dissipate heat thus keeping packing rings at lower temperatures—gives them longer life.

These valves are available with either socket weld ends or screwed ends, in sizes ranging from ¼ to 2 inches. For further information on Walworth series 1500 Small Cast Steel Valves, see your local Walworth distributor, or write for Circular No. 134.

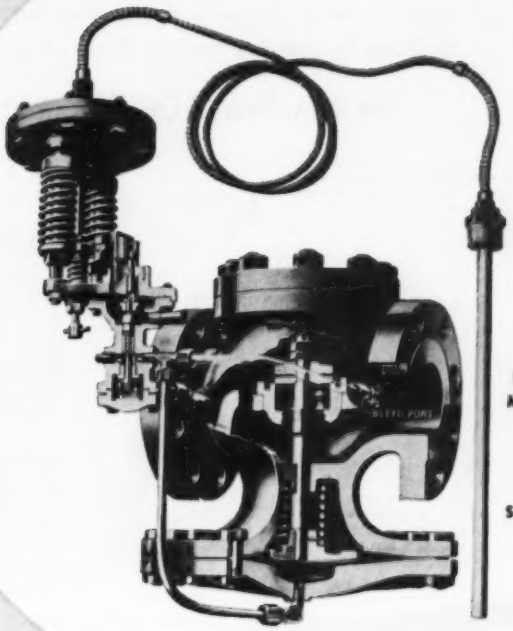
WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

3 Reasons for Accurate Regulation



Spence

Packless construction eliminates the need for closely fitted parts that may stick or bind due to dirt or uneven expansion of the parts.

In Spence Temperature Regulators, the Main Valve is actuated by a large balanced metal diaphragm which responds to the slightest changes in temperature.

Sensitive Pilots are designed to limit heater pressure to an adjustable maximum. As the temperature at the thermostat drops a few degrees there is a corresponding increase in steam pressure up to the limit for which the Pilot is set.

With regulators that respond only to temperature, an increase in load is accompanied by a momentary decrease in steam pressure caused by faster condensation in the heating element. There is a time lag until the thermostat senses the temperature drop and opens the valve wider. Spence Temperature Regulators act like pilot operated pressure regulators when this occurs. They respond instantly to maintain the steam pressure until the thermostat has a chance to further increase it as needed for the heavier load.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year, without requiring extensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.

SK120

SPENCE ENGINEERING COMPANY, INC., Walden, New York

Better Valves–Year After Year

Because throughout more than a hundred years Powell Engineers have never been willing to "let well enough alone," the Powell Line of Valves has been continually improved and expanded to satisfy every new demand of industry.

That is why there is a greater variety of Powell Valves in service today than of any other make.

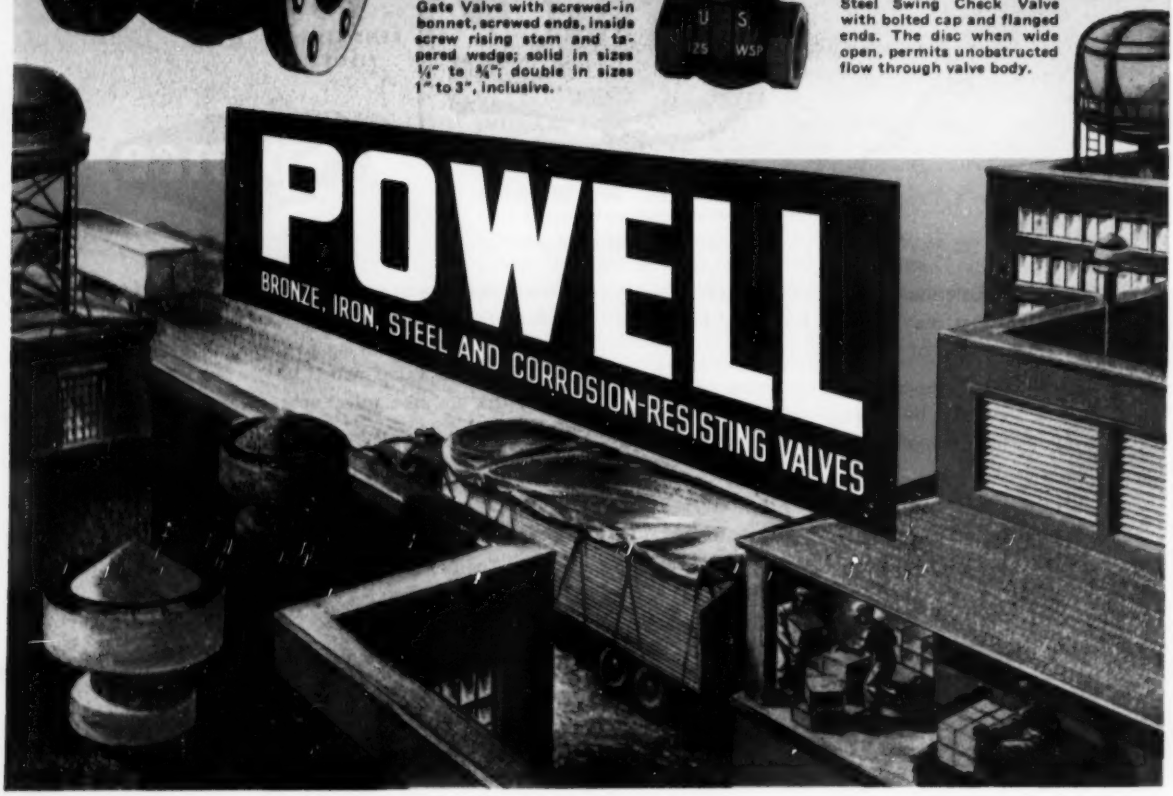
The Wm. Powell Co., Cincinnati 22, Ohio

Fig. 1793 — Large 125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Made in sizes 2" to 30", inclusive.

DEPENDABLE VALVES SINCE 1846

Fig. 500—125-pound Bronze Gate Valve with screwed-in bonnet, screwed ends, inside screw rising stem and tapered wedge; solid in sizes ¼" to ¾"; double in sizes 1" to 3", inclusive.

Fig. 1561 — 150-pound Cast Steel Swing Check Valve with bolted cap and flanged ends. The disc when wide open, permits unobstructed flow through valve body.



Now From **DETROIT** Comes

the biggest sales booster to hit the hot water heating field in years!

WEATHERBRAIN

The Completely Automatic Heating Control!

Weatherbrain indoor-outdoor control regulates room temperature all winter long without ever a manual adjustment.

Now you can cash in on big, new profits in the hot water heating field with DETROIT'S amazing Weatherbrain Control.

That's because Weatherbrain indoor-outdoor control offers heating comfort never before possible in forced hot water heating systems—constantly uniform and completely automatic. Once installed, the user never makes a manual adjustment of any kind. The Weatherbrain Control's outdoor bulb senses changes in outside temperature and responds instantly by supplying the exact amount of heat to keep room temperature right where it should be! And because it is entirely mechanical in operation with no expensive, complicated electronic gadgets to go wrong, Weatherbrain Control is less costly and more easily installed than any other control of its type. See your DETROIT wholesaler or write for Bulletin No. 254.

CHECK THESE FEATURES

- Varies the water temperature delivered to panels or radiation in exact accordance with the demands of the weather.
- All mechanical; no delicate mechanisms, electronic tubes or relays.
- Well adapted to zone systems because of its simplicity and reasonable cost, and where the electrical boiler resetting type control will not work.
- Gradual changes in water temperature in the system minimize the undesirable effects of thermal expansion and contraction.
- Very valuable where more than one type of radiation is used.

ESTABLISHED AS DETROIT LUBRICATOR COMPANY IN 1877

DETROIT-Controls CORPORATION

5900 TRUMBULL AVE. • DETROIT 8, MICHIGAN Division of American Radiator & Standard Sanitary Corporation

Representatives in Principal Cities • Canadian Representatives in Montreal, Toronto, Winnipeg—Railway & Engineering Specialties, Ltd.

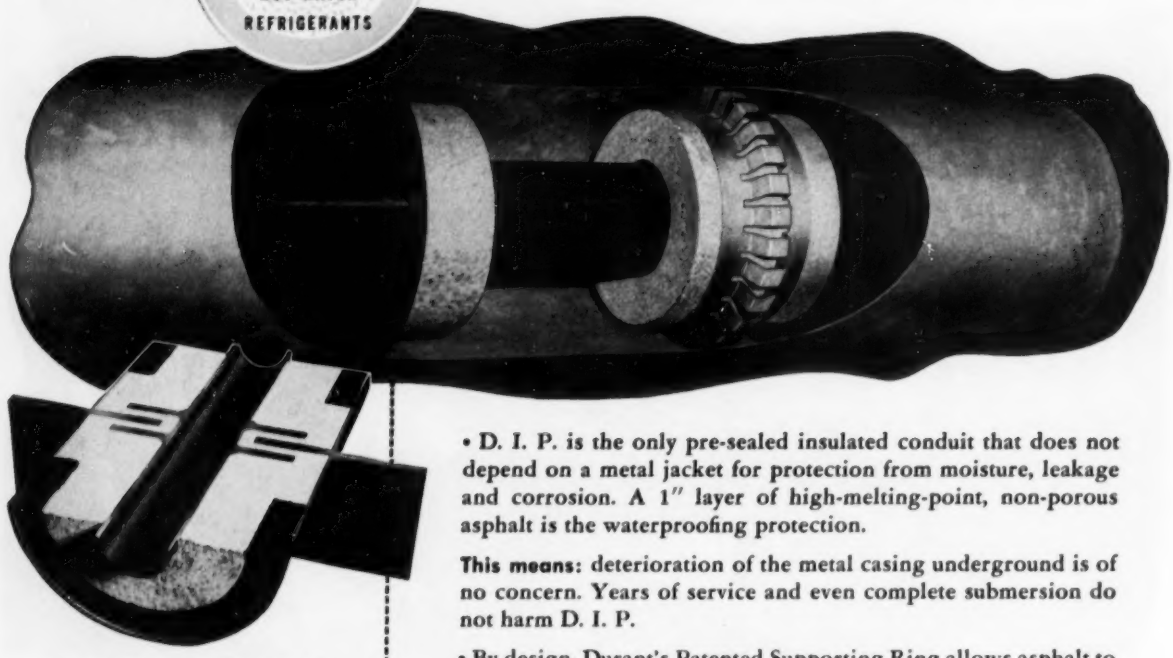
AUTOMATIC CONTROLS *for* REFRIGERATION • AIR CONDITIONING • DOMESTIC HEATING • AVIATION TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

Serving home and industry — AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

Only DURANT Pre-sealed Insulated Pipe gives you these features:

D.I.P.®

FIRST IN THE FIELD OF PRE-SEALED INSULATED PIPING FOR STEAM HOT WATER REFRIGERANTS



Durant Patented Insulated Anchor

• D. I. P. is the only pre-sealed insulated conduit that does not depend on a metal jacket for protection from moisture, leakage and corrosion. A 1″ layer of high-melting-point, non-porous asphalt is the waterproofing protection.

This means: deterioration of the metal casing underground is of no concern. Years of service and even complete submersion do not harm D. I. P.

• By design, Durant's Patented Supporting Ring allows asphalt to flow through openings during fabrication to *encase* the ring.

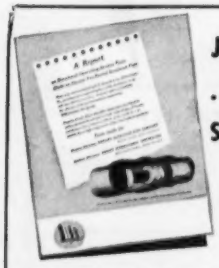
This means: water or moisture cannot pass through support points to the insulation or pipe. It means efficient insulating properties and extreme durability.

• Durant's Patented Insulated Anchor eliminates contact between anchor plate and pipe.

This means: reduced heat loss and elimination of corrosive electrolytic action at anchor points.

Many other advantages come with D. I. P.—such as low cost installation, for the Durant field joint can be made swiftly and easily. D. I. P. does not require external casing-welding: nor does it require concrete tunnels, slabs, rollers, supports, drains or additional protection for superimposed loads—such as under roadways or railroad tracks. Steam pressures to 1000 psi.

Durant's engineering staff and representatives are at your service. Write us today for Catalog 8-A.



JUST OFF PRESS

...A Report on Simulated Operating Service Tests Made on D.I.P.

This 6 page bulletin contains a detailed report on methods, temperature recordings and results of recent tests made by an independent engineering firm to determine (1) temperatures developed in and near D.I.P. conduit buried 48″ underground, and (2) effects, if any, on D.I.P. due to high temperature and water-soaked insulation.

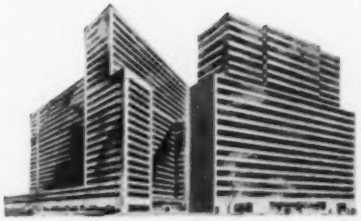
May we have your address so we can mail you a copy?

Representatives in Principal Cities

PRE SEALED®

Western Division: **DURANT INSULATED PIPE COMPANY**
WARREN WAY AND BAY ROAD, PALO ALTO, CALIFORNIA

Eastern Division: **DURANT INTERNATIONAL CORPORATION**
WILLIAMSTOWN, NEW JERSEY



The type it installed in Philadelphia's luxurious Rittenhouse Claridge and Savoy?

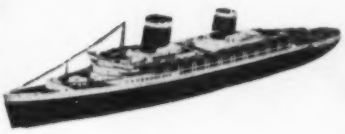
The advanced system recommended for the St. Francis Hospital in Lynnwood, Calif.?

The system chosen for guest comfort in Cincinnati's famed Netherland-Plaza Hotel?

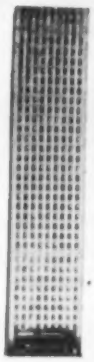
Which York system of air conditioning should you buy?

The engineering feat accomplished for New York's Empire State Building?

The battery of Turbo Compressors installed in the great new *S.S. United States*?



The all-year-comfort system chosen for the beautiful Esso Building in New York City?



YOUR BUILDING CAN TELL YOU

That's because York has taken the compromise out of air conditioning.

You see, York Engineers work with a wide range of equipment. They do not have to compromise—and try to fit a rigid system to a building or fit the building to a system.

They can recommend with broad impartiality the installation that precisely suits the particular requirements of the building you are air conditioning. The result, of course, is better performance, longer life, at lower initial and operating cost.

There is a York Engineering Office near you. Give them a call. There is no obligation, naturally. Or write directly for details to York Corporation, York, Pa.

YORK AIR CONDITIONING AND REFRIGERATION
HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

GIVE BLOOD

...give it again and again

BUSINESS EXECUTIVES!

CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

THEY'RE LOOKING DOWN YOUR PIPELINE...

Those twin scourges of industry—Lost Production and High Maintenance—are constantly drawing a bead on economical operation . . . looking down this nation's arteries for the lines of least resistance to heat, pressure and corrosion.

There *is* one way to spoil their aim: make sure that *your* pipe and tubing sections are joined with fittings of a kind that match them in chemical and physical properties, in strength and weight.

W-S Double-Diamond FORGED STEEL Fittings in both screw-end and socket-weld types give you all these qualities . . . provide life-of-the-line joints for any kind of make-up.

Literature is available . . . write for it.

SOLD THROUGH LEADING DISTRIBUTORS

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

132 ALDENE RD., ROSELLE, NEW JERSEY

9-0-2

They cost no more . . . So why settle for less!

THE BEST AUTOMATIC AIR VALVES FOR EVERY HOT WATER HEATING JOB ARE LABELED . . .

MAID-O'-MIST AUTO-VENT®

NUMBER 7 AUTO-VENT

For mains, pipe lines, unit heaters, convectors, panels, coils, etc. A favorite . . . proved dependable on hundreds of thousands of installations.

- Self - closing, float - controlled valve
- Non - ferrous metals
- No air chamber required
- Designed for pressures up to 75 lbs.

For vertical mounting only. Size 4⅜" x 2¼" with ⅛" I.P. female connection.

NUMBER 27 AUTO-VENT

For convectors and for space limitations.

- Dependable float-operated valve
- Non-ferrous metals
- No air chamber required
- For pressures up to 50 lbs.

For horizontal mounting only. Size 3" x 2¼" with ⅛" I.P. female side connection.

NUMBER 72 AUTO-VENT

For convectors, baseboard and free-standing radiation. The fastest venting valve (expansion type) on the market!

- Expansion and contraction confined to 4 vent slots only
- Special composition control disc
- Internal siphon tube
- No air chamber required

For vertical or horizontal mounting. Size 1¼" x ½" with ⅛" I.P. male connection.

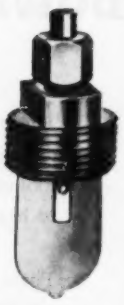
MAID-O'-MIST BALANCING VALVE ADAPTER UNITS

MAKE ANY COPPER, BRONZE OR CAST IRON TEE A BALANCING VALVE!

No. 14 Balancing Valve Adapter Unit for ⅜", ½" ¾", 1" nominal copper tees.

Any stock tee, plus the Adapter Unit completes a balancing fitting for hot water heating systems. These new units, quickly soldered or sweat-fitted into copper and bronze tees or threaded into cast iron tees, regulate the flow of hot water through radiators, convectors, baseboard panels, radiant coils, return mains and branches. Precision made of non-ferrous metals.

Full free flow through the tee. No restriction except for the balancing required.



No. 15 Balancing Valve Adapter Unit for ½", ¾", 1", 1¼" cast iron tees.

NUMBER 67 AUTO-VENT

For convector and baseboard radiation

- Self-closing float operated
- Compact size
- Non - ferrous metals
- No air chamber required
- For pressures up to 30 lbs.

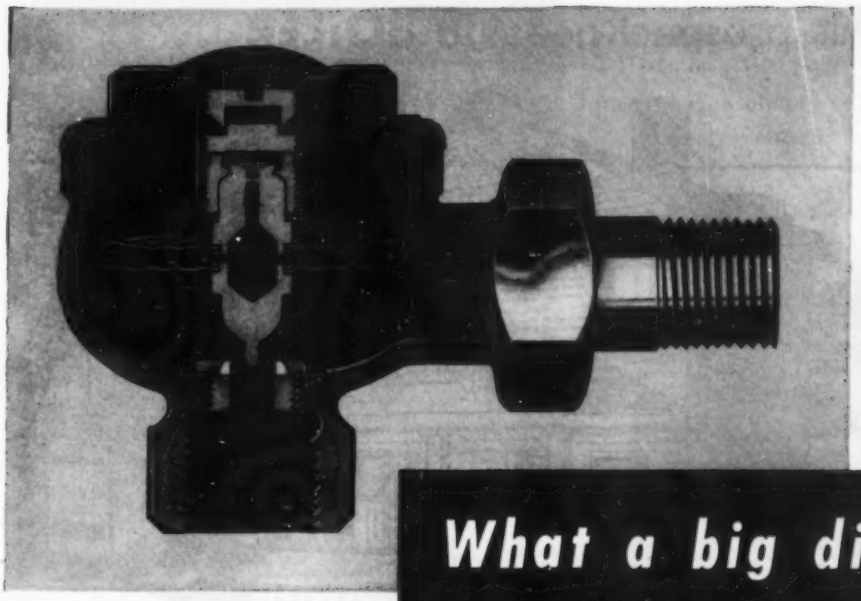
For vertical mounting only. Size 3-3/16" x 1½" with ⅛" I.P. male connection.

MAID-O'-MIST Inc. HEATING SPECIALTIES

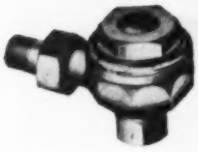
AUTOMATIC HUMIDIFIERS . . . . AUTO-VENTS
WATER LINE CONTROLS . HEATING SPECIALTIES

MAID-O'-MIST, Inc.

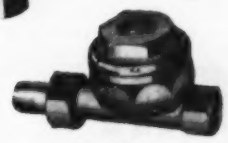
3217 NORTH PULASKI ROAD . CHICAGO 41, ILL.



What a big difference a trap can make!



Angle



Straightway

Vertical

Left hand corner

Right hand corner

Marsh Packless Radiator Valves are perfect team mates for Marsh Radiator Traps. The metal-to-metal seal places them in a class all their own.

Yes, the success or failure of a steam distribution system can hinge on things as small as radiator traps. That's why it pays to use Marsh Radiator Traps—traps that are individually and permanently adjusted to close tight on steam, but open promptly and pass air or condensate at temperatures only a few degrees below closing temperature.

The part that provides positive operation in Marsh Radiator Traps is that rugged-but-sensitive thermostatic diaphragm. After this element has been assembled it is made completely seamless by a heavy overall deposit of copper. It is then filled with an accurately measured charge of volatile fluid; finally tested by expert operators to make sure that its expansion and contraction is exactly right to produce the utmost efficiency and economy.

Construction throughout is in keeping with the effective diaphragm. Bodies are of extra heavy cast brass suitable for pressures up to 125 lbs. steam. Bonnet assemblies of a given type and size are interchangeable. Trap seats are renewable. All components are made with a large safety factor beyond rated operating pressures.

Next time make it Marsh throughout and see the difference . . . Marsh traps, packless valves, bucket traps, venting valves. All are covered in the new fact-filled catalog.

MARSH HEATING EQUIPMENT CO.

Sales affiliate of Jas. P. Marsh Corporation

Dept. T, Skokie, Illinois

MARSH

Heating Specialties **SINCE 1865**

When this prospect needs a **BOILER...**

HERE'S WHY IT'S EASIER TO SELL A bryant

It's easier to sell high quality! Bryant Boilers have been a standard of comparison in the industry for over 40 years.

It's easier to sell a full line! There's a Bryant Boiler for any steam or hot water system. They are available in an unmatched range of sizes.

It's easier to sell true convenience! Only in Bryant Boilers will you find convenience features like "Safety Sentinel" Pilot, "Magic-Action" Valve and "Finger-Tip" Igniter.

It's easier to sell a name that everybody knows! Your prospects know Bryant as a result of consistent local and national advertising—and by a reputation dating back to the introduction of the first fully automatic gas-fired boiler over 40 years ago.

Add this important plus! Bryant Distributor warehousing and service are strategically located near you to assure prompt service . . . low inventory requirements.

Contact your Bryant Distributor for complete information or write: Bryant Heater Division, Affiliated Gas Equipment, Inc., 17825 St. Clair Avenue, Cleveland 10, Ohio.

Profit with the name that everybody knows...

THE MOST COMPLETE LINE OF HOME CONDITIONING EQUIPMENT IN THE INDUSTRY

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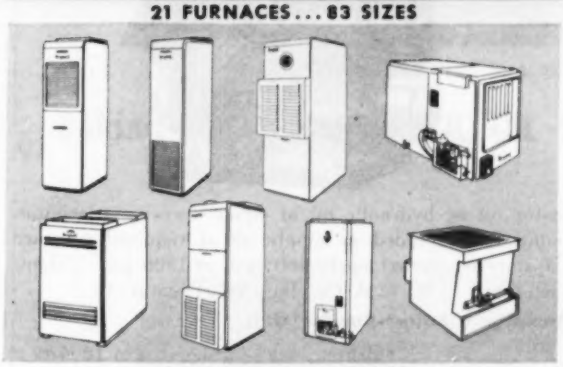
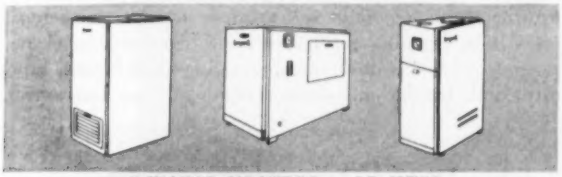
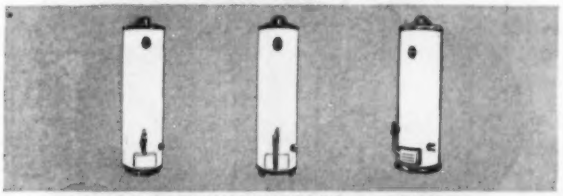


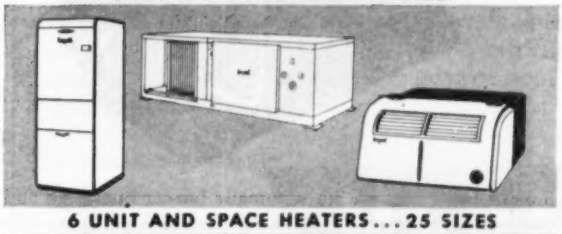
4 BOILERS... 45 SIZES



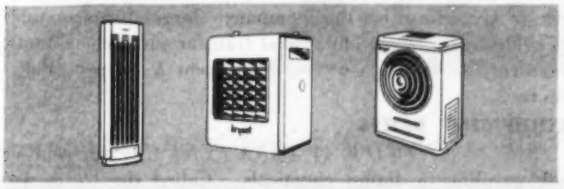
5 WATER HEATERS... 15 SIZES



3 AIR CONDITIONERS... 7 SIZES



6 UNIT AND SPACE HEATERS... 25 SIZES



bryant®

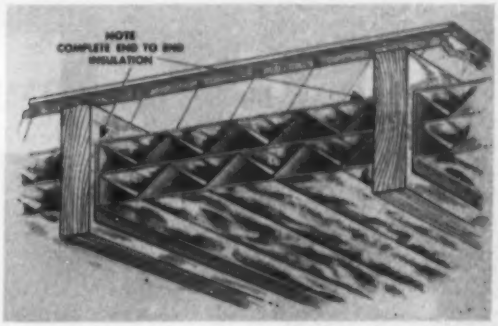
HEATING • AIR CONDITIONING • WATER HEATING

[Continued from page 176]

of high temperature silicone. [Manufacturer: McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18.]

Aluminum Insulation

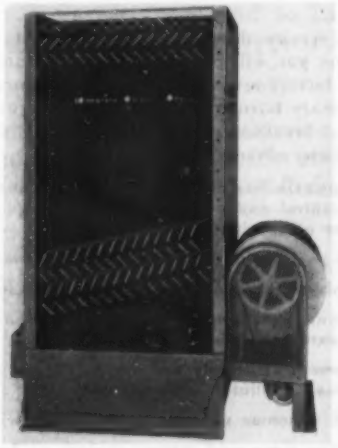
Insulation coverage between studs and joists is the feature of a newly developed multiple accordion aluminum. . . .According to the manufacturer, it is insulating against heat loss or intrusion and condensation



formation. The accordion aluminum creates multiple reflective, low-conductive, convection-retarding spaces. It is said to interpose an impervious barrier to water vapor or to any other gas, including warm or cold air. [Manufacturer: Infra Insulation, Inc., 525 Broadway, New York.]

Mechanical Draft Cooling Towers

"Series 3-B" mechanical draft cooling towers feature spray deck construction . . . . The company states that the decks expose more water surface to the cooling air and also distribute air evenly through the tow-



er. Squirrel cage blowers are used to create mechanical forced draft. Single, twin and triple blower models are made for capacities of 1 to 108 tons of refrigeration. [Manufacturer: Binks Mfg. Co., Water Cooling Div., 3122 Carroll Ave., Chicago 12.]

Four-Way Hydraulic Valve

*"Type 555-RO" four-way hydraulic valve designed to provide a simple and reliable self-contained valve mechanism to position double acting hydraulic cylinders or hydraulic motors . . . . Applications include hy-

CFE Control Cabinet for single boiler installation.

◀ Closed view of same cabinet.

Here's a new service that saves you time, cost, worry and service calls on gas, oil, combination fuel or stoker installations. CFE factory-assembled, packaged control cabinets group all primary burner controls, flame safeguards, gages, fuses or circuit breakers, etc., in one neat, compact cabinet, giving you these advantages:

- **One responsibility for all controls—including CFE damper control and other CFE units as required, plus equipment as specified or furnished.**
- **Only one purchase order instead of 10 or more.**
- **All controls mounted, piped and wired into a single unit.**
- **Convenient, well identified terminal connections to simplify external wiring.**
- **All equipment accurately and thoroughly pre-tested for trouble-free installation and operation.**
- **Increased customer satisfaction and good will.**
- **Installation time and money savings go far toward paying for cost of cabinet.**

Write for complete information.

The CFE line includes damper controls, steam controls, electronic smoke detector control units, draft, air pressure and flue temperature gages.

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CLEVELAND FUEL EQUIPMENT COMPANY

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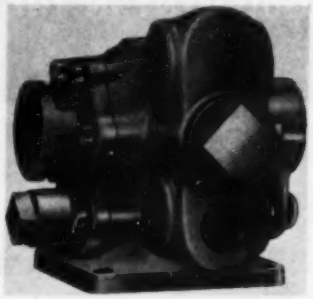
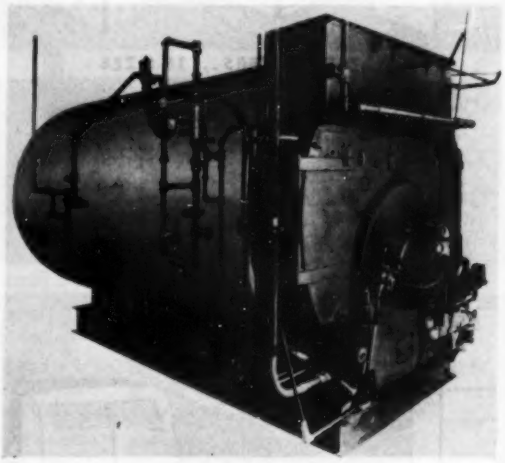
draulic lifts, bulldozers, road machinery, mining machinery, earth moving machinery, power tools, farm machinery and other single purpose applications. Design pressures are 300 to 1500 psi. The operating fluid is No. 10 S.A.E.



motor oil or hydraulic oil of equal viscosity, a separate pump being needed to supply oil at required pressure. Capacity is approximately 400 gpm at 1500 psi. [Manufacturer: A. W. Cash Co., Box 551, Decatur, Ill.]

Packaged Boiler-Burner Unit

**Oil-fired boiler-burner unit in 16 sizes to 600 hp output . . . . The scotch marine-type boiler is furnished with handhole and manhole fittings, smokebox, combustion chamber refractory lined, combination clean-out and inspection door, supporting lugs and beams, tube brush with handle and steam trimmings. An instrument



panel includes controls for automatic burner operation and combustion safeguards. Working pressures go up to 150 psi. According to the company, large furnace tube provides maximum radiant heat transfer surface. [Manufacturer: C. Hoffberger Co., Monument & Forrest, Baltimore 2.]

EQUIPMENT BRIEFS . . .

TWO-WAY TANK VENT CAP for venting oil, gasoline or liquid chemicals. Called the "2 in 1," the cap is set on the pipe and tightened with a set screw. [Manufacturer: Sicard & Paul, 2921 Stevens Ave., Minneapolis 8.]

LINEAR PROPORTIONAL SOLENOID for jet aircraft fuel control and other applications. The solenoid operates in direct linear proportion to the amplified energy produced by a thermocouple. [Manufacturer: Connecticut Telephone & Electric Corp., Meriden, Conn.]

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Baking Type **PHENOLIC OIL FREE COATINGS** **Self-Curing Type**

Illustrated above are blowers processed with the HERESITE Industrial Finish which are to be used in connection with sulphuric acid fumes.

Duct systems, blowers, stacks, heating and cooling coils etc. exposed to fumes of most acids can be completely protected with the HERESITE baking type coatings.

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The VR-500 Series Airdry coatings are especially suited for masonry surfaces, hoists, monel-rails, structural steel and maintenance in general. They provide maximum protection where it is found impractical to apply the Heresite Industrial Baked Finishes.

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RECENT TRADE LITERATURE...

Air Compressor

Bulletin A-44 contains photographs, section drawings and dimensions of the "WGO-9 Oil-Free Air Compressor." The model is a vertical compressor, designed for applications where compressed air must be completely free of lubricating oil. Specifications on the company's line of non-lubricated compressors from 172 to 2800 cfm, 25 to 600 hp, are included. [Manufacturer: Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22.]

Blower Wheels

Technical catalog contains specifications for blower wheels ranging in size from 4-13/16 in. in diameter through 12-⅜ in. Dimensions and performance data are given for each size for both single and double inlet wheels. Also included are performance data charts for double inlet double width blower wheels, and dimensions for sheet metal housings and hubs. Each wheel size and model is illustrated by photographs and line drawings. [Manufacturer: Revcor, Carpentersville, Ill.]

Centrifugal Unit Heater

Sixteen-page catalog describes the manufacturer's line of centrifugal fan type unit heaters. Included are photographs, applications, specifications and optional features. Diagrams show typical mounting arrangements. Tables and charts show capacities of various models. [Manufacturer: Airtherm Mfg. Co., 750 S. Spring Ave., St. Louis 10.]

Chemical Feed Pump

Bulletin No. PM 21 contains a description and specifications for the firm's chemical solution feed pump. A positive displacement, diaphragm type pump, one of its uses is to feed chemical solutions for the prevention of corrosion, scaling and organic growths in pipe lines, tanks, boilers, cooling towers, etc. [Manufacturer: Precision Machine Co., 8 Walnut St., Somerville 43, Mass.]

Coils for Heating, Cooling

Four new two-page, two-color technical bulletins describe the firm's water, blast heat, refrigerant and steam distributing tube coil lines. Bulletin No. 65C covers blast heat coils designed for heating, drying, tempering and other applications where high or low pressure steam is the source of heat. Bulletin No. 66C presents a description and specifications of steam distributing tube coils for use in heating applications where the steam supply is modulated. Bulletin No. 67C deals with extended surface coils for cooling and heating with water. Bulletin No. 69C describes direct expansion coils for use with "Freon" or similar refrigerants. [Manufacturer: United States Air Conditioning Corp., 3300 Como Ave., S.E., Minneapolis 14.]

Controls Selection

A new catalog, "Guide to the Selection and Application of Push-Pull Controls," now is available. It contains engineering data, discussion of factors to consider in planning control applications, together with blueprints and illustrations of various control models avail-

✓ COMPACT
✓ ECONOMICAL
✓ Engineered for Better Service

TITUSVILLE
"Compact" STEEL HEATING
BOILERS

✓ AUTOMATIC WELDING
—assures strong joints and seams
✓ AMPLE COMBUSTION AREA
—burns all fuels efficiently
✓ POSITIVE CIRCULATION
—with high velocity side circulators
✓ FULL WIDTH FLUE DOORS
—quick access to tubes
✓ MANY OTHER FEATURES

Write for the facts on this famous Titusville Boiler—Bulletin B-3000-B gives you detailed descriptions, specifications and dimensions, free on request.

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A division of Struthers Wells
Representatives in Principal Cities
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able. [Manufacturer: Arens Controls, Inc., 2017 Greenleaf St., Evanston, Ill.]

Corrosion Resistance of Copper

The results of 27 years of laboratory research and field study of the nature of corrosive attack on copper and copper alloys have been brought up to date in *Corrosion Resistance of Copper and Copper Alloys, Publication B-36R.* Explained is the chemical and physical nature of corrosive attack in its various forms. Included is a tabulation indicating the relative corrosion resistance of the principal types of copper and copper base alloys when in contact with 183 different corroding agents. In the recently revised edition, more information has been added on stress-corrosion cracking, galvanic corrosion, fresh and salt water corrosion. The section on corrosion in petroleum refineries has been completely revised. [Published by: The American Brass Co., 414 Meadow St., Waterbury 20, Conn.]

Connect-Disconnect Couplers

This is the first technical catalog prepared by the company on its "Hi-Flow" line of connect-disconnect couplers. According to the bulletin, these couplers handle air, water, oil, gas, steam and most chemicals and indicate up to 80 percent flow. Several tables include data such as sizes, dimensions, coupled and uncoupled lengths, unit weights and standard pressures. Each model is illustrated. [Manufacturer: Snap-Tite, Inc., 201 Titusville Rd., Union City, Pa.]

Deaerator for Feed Water

Bulletin 575 describes the new engineering approach and results achieved with the company's "Zero-Oxygen" deaerator. According to the manufacturer, the new design removes all oxygen and other non-condensible gases from boiler feed water. The bulletin also states that the complete system integrates condensation recovery, deaeration, water storage and automatic boiler feeding into a single balanced system. [Manufacturer: Fred H. Schaub Engineering Co., 2110 S. Marshall Blvd., Chicago.]

Electrical Fittings

Catalog 53 describes the manufacturer's line of solderless wire connectors and specialized electrical fittings. Included is illustrated descriptive material on pressure connectors for solderless wire splicing and terminating, "Bushend" insulated bushings for electrical metallic conduit, "Snap-Action" plugs for temporary or permanent plugging of knockout holes in wiring device boxes and other applications. Also described are molded terminal blocks in various styles, types, and sizes. Specifications, dimensional data, application instructions and ordering information are included for all products. [Manufacturer: Buchanan Electrical Products Corp., Hillside, N.J.]

Fan Engineering Manual

Catalog No. 20 is a 64-page illustrated guide to modern industrial ventilation and air movement. Included are engineering, installation and operating data for all standard and special duty fan applications. Details for calculating duct sizes, friction losses, performance and horsepower requirements are given. Complete descriptions of the company's fans and accessory equipment

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This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult piping problems encountered in different industrial plants were successfully worked out by piping experts.

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Foster Reducing Valves, Relief Valves, Vacuum Breakers and Liquid Level Valves are available in all-stainless construction to resist corrosion and avoid contamination.

All valve parts in contact with fluids may be had in a wide range of corrosion resisting alloys.

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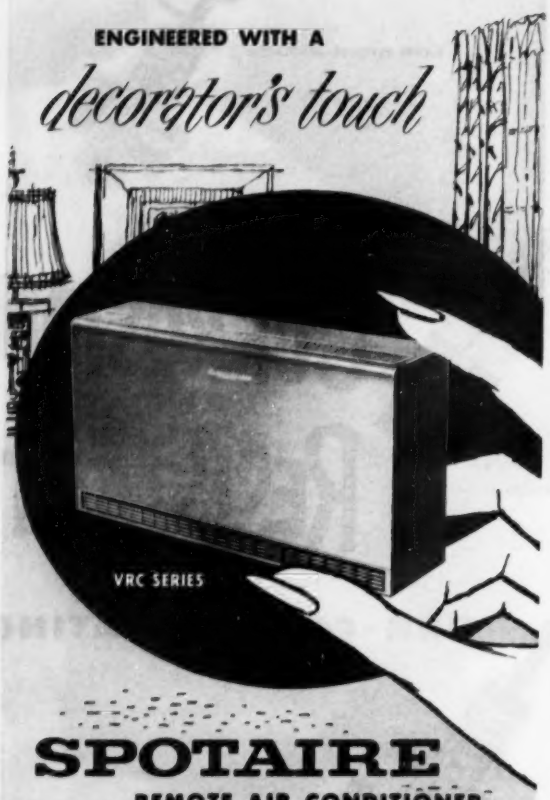

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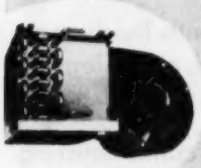
Smartly finished in gray hammertone enamel, the Spotaire VRC Series, is fashioned to grace any residential, commercial or institutional setting.

Here's convenience, comfort, economy and flexibility. Spotaire offers individual controlled air conditioning—plus the silence of a central duct system but less the costly and extensive ducts.

Illustrated with the VRC Series is the Spotaire HRC Series, the world's finest concealed air conditioning unit ...equal only to the VRC Series in function and economy.



Just check these advantages:

- Quiet Beyond Belief.
- Large slow-speed direct connected blower.
- Installed like a radiator (VRC Series).
- For Freon or hot and cold water circulation.
- Heats, cools, dehumidifies, ventilates and filters.
- Lower initial and operating cost.

Long established in commercial refrigeration and air conditioning, Drayer-Hanson offers a complete line of air conditioning and refrigeration products. *Catalogs are available upon request.*

A limited number of territories are available for qualified manufacturers' representatives.

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also are shown. [Manufacturer: Aerovent Fan Co., Inc., 720 E. Ash St., Piqua, Ohio.]

Flame Cutter for Welding Fittings

Bulletin FC-8 is an illustrated folder showing the operation and uses of the "Universal" flame cutter for cutting new and used welding fittings. According to the company, the cutter just requires connection to the user's source of gas and power. Torch, hoses, unitized gas valves, switch, motor, etc., are incorporated in the machine. Engineering data, capacities and dimensions are included. [Manufacturer: Vernon Tool Co., Ltd., 1101 Meridian Ave., Alhambra, Calif.]

Flexible Metal Hose

Bulletin No. 15-D on flexible metal hose contains illustrations of the company's line of high pressure interlocking bronze and steel flexible hose, tar and asphalt hose, loading and unloading, and necessary couplings. The bulletin lists all current applications and provides test and engineering data. [Manufacturer: Atlantic Metal Hose Co., c/o David M. Fuchs, Sales Manager, 123 W. 64th., New York 23.]

Heat Exchangers and Water Heaters

Sixteen-page Catalog No. 5 covers hot water storage heaters and heat exchangers. Included are horizontal and vertical hot water storage heaters, instantaneous water heaters, convertors, condensate cooler, fuel oil heaters and instantaneous suction heaters for viscous fluids. Various tables enable selection of the correct equipment for a given operating condition. Typical examples demonstrate the use of the tables. [Manufacturer: Patterson-Kelley Co., Inc., 598 Warren St., East Stroudsburg, Pa.]

Heat Transfer Bulletin

"Young Heat Transfer Topics" is the title of a two-color external house organ currently published by the Young Radiator Co. Published bi-monthly, its purpose is to disseminate engineering information on installations such as convectors, unit heaters, heating coils, cooling coils, air conditioning units and evaporative coolers and condensers. It is offered free of charge to all interested architects, heating contractors, builders, engineers, etc. Available from: Editor, Heat Transfer Topics, Young Radiator Co., 709 S. Marquette St., Racine, Wis.

Inert-Gas Metal-Arc Welding

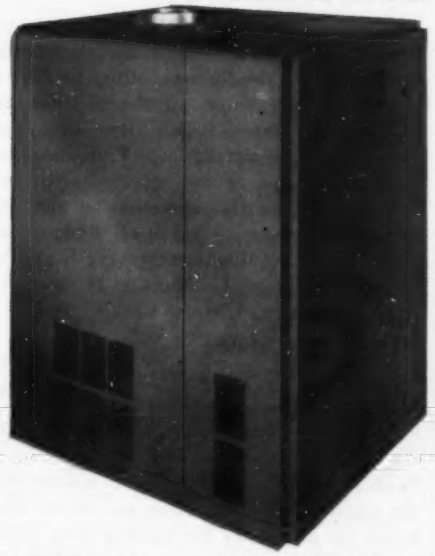
An eight-page reprint from "The Welding Engineer" and titled *Will Inert-Gas Metal-Arc Save Money on Mild Steel?* is available. Authored by G. C. Christopher and R. C. Becker of the research laboratories of International Harvester Co., this article reports the results of weld tests on mild steel with the inert-gas metal-arc welding method. The welding data accumulated from these tests are recorded in tables which show costs as compared to the conventional method of welding mild steel. Graphs and cross-section photos of weld deposits are included. [Published by: Air Reduction Sales Co., 60 E. 42nd St., New York 17.]

Insulated Metal Wall Panels

This new catalog contains descriptive information, illustrations, specifications and detailed draw-

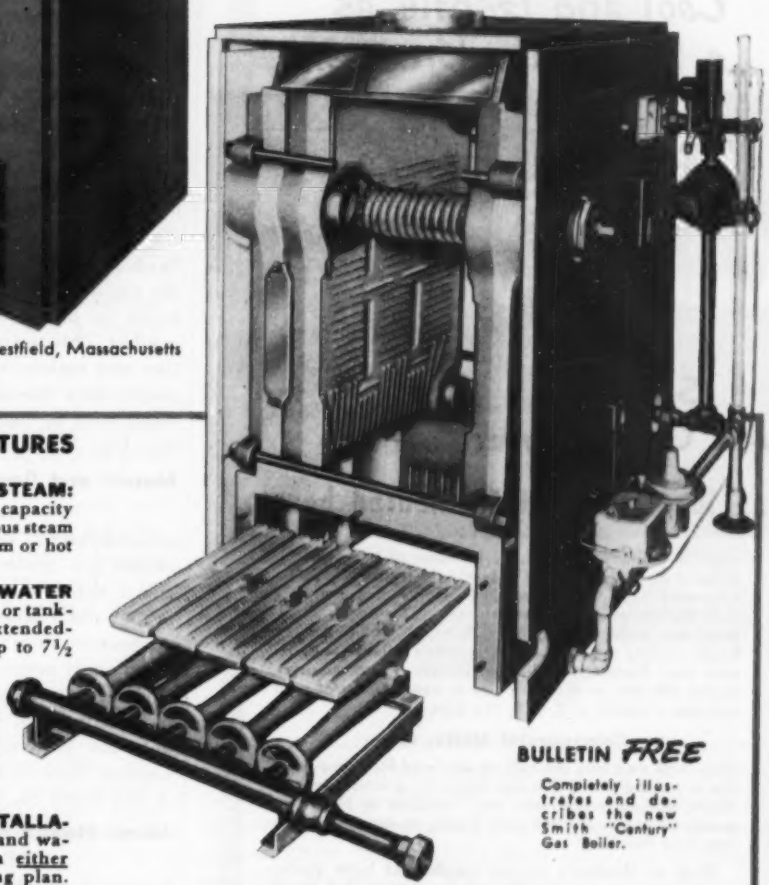
H.B. New Smith "Century" Gas Boiler

engineered from the ground up — AGA approved



Input Ratings from 138,000 Btu to 745,500 Btu

"Century" is a completely new line of H. B. Smith Boilers, incorporating exclusive developments in gas boiler design. They provide economical, dependable heat (hot water or steam), with ample domestic hot water. Compact, attractive insulated steel jacket in smooth hammer-tone blue! Free Bulletin describes the Smith "Century" in detail.



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Established 1853

QUICK REVIEW OF FEATURES

1. **WATER CAPACITY FOR STEAM:** Boiler sections of extra large capacity hold sufficient water for continuous steam generation . . . adaptable for steam or hot water heating.
2. **LARGEST DOMESTIC HOT WATER SUPPLY:** Provides built-in tank or tankless heater with new, compact extended-surface copper coils — insures up to 7½ gals. of hot water per minute.
3. **DURABLE CAST IRON:** Boiler embodies typical rugged Smith construction with cast iron water-tube sections, highly resistant to corrosion. Can be expanded as building grows.
4. **ADAPTABLE FOR ALL INSTALLATIONS:** Gas intake and controls and water connections can be made on either side of boiler, according to piping plan.
5. **REMOVABLE BURNER ASSEMBLY:** For ease in servicing, entire burner assembly is removable by disconnecting one union.
6. **PRECISION-DRILLED RAISED PORTS:** Cast iron burners with precision-drilled raised ports. If debris should fall on burners, it cannot interfere with complete combustion.
7. **SAFETY-PLACED GAS PILOT:** Pilot located at center of burner on intake side insures prompt, smooth ignition of all burner units. No popping.
8. **GAS CONTROLS AND SAFETY DEVICES:** Boiler features the latest AGA approved gas controls and safety devices, conveniently located.
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Completely illustrates and describes the new Smith "Century" Gas Boiler.

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Cool and Gentle as a Mountain Breeze...
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Summer Air Conditioner
...ideal for radiator-heated homes
Mueller Climatrol solves the problem of how to cool radiator or radiant-heated homes with the new Mueller Climatrol 904. A self-contained cooling unit complete with blower — the 904 has provisions for duct connections that make it ideal for radiator or radiant-heated home cooling applications. It is also available with return and discharge grilles as shown. Trim, compact, highly efficient — there's a size to handle most of your customers' needs — 2, 3, 5, 7½ tons.
Commercial Units, too
This same unit hits the nail on the head for commercial use in small groceries, barber shops, drug stores, apparel shops, florists, restaurants, etc. Finished in handsome gunmetal gray—the 904 adds beauty to interiors wherever it is installed.
Built to Mueller's 96-year standard of high quality —the 904 gives you the dependable service that means greater customer satisfaction. Be sure to investigate the 904 — it's the latest product from the Big Name in Heating and Cooling.
L. J. MUELLER FURNACE CO.
2023J W. Oklahoma Avenue • Milwaukee 15, Wisconsin
96th Anniversary
Mueller Climatrol
D-139
This is only one of many new items in the 1953 Mueller Line. Write for the latest information on the new Mueller Climatrol 904 Self-Contained Cooling Unit.

ings of the firm's insulated metal wall panels. The booklet was prepared primarily for architects, engineers and general contractors and provides information on the types of materials, textures and colors in which the panels are available [Manufacturer: The Steelcraft Mfg. Co., Blue Ash Rd., Rossmoyne, Ohio.]

Internal Downflow Purifier

Bulletin 401 describes internal downflow "Hi-eF" purifiers for steam drums, flash tanks, evaporators, packed towers, deodorizers, stills, bubble-cap towers and receivers. One feature of the bulletin is two pages of selection tables which help in choosing a purifier for steam, air, gas or vapor installation. With these charts are shown typical examples of the solutions. Other parts of the bulletin describe the operation of the purifier, its advantages and uses, a table of dimensions, weights and specifications. [Manufacturer: V. D. Anderson Co., c/o William J. Gleason, Jr., Manager of Steam Specialties Div., 1935 W. 96th St., Cleveland 2.]

Metal Hose Catalog

"Titeflex" helically-wound flexible metal hose and "Uniflex" helically-corrugated flexible metal hose are illustrated in the manufacturer's Catalog No. 200. Complete descriptions and specifications are given for flexible metal hose, fittings and assemblies. Featured in the engineering data section are charts showing frictional losses vs. flow rates for various sizes of metal hose and conduit. This section also contains information on installation and maintenance of metal hose. A series of photographs show how seamed metal hose is manufactured, from metal strip to completed assembly. [Manufacturer: Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N.J.]

Motors and Generators

Consolidated catalog contains facts on manufacturer's line of motors and generators. Included are detailed information on performance, dimensional data, construction advantages, installation photographs and a summary of the company's history. Product application information is given in charts to aid in the selection of motors for ordinary applications of polyphase squirrel cage induction motors. A special page is devoted to electrical and mechanical modifications that are available for particular installation needs. [Manufacturer: General Dynamics Corp., Electro Dynamics Div., Avenue A and North St., Bayonne, N.J.]

Motor Standards

Bulletin GEA-5995 contains complete information on the new NEMA motor standards including new frame dimensions for a-c motors from 1 to 30 hp. The bulletin compares the old with the new frame assignments for open-type polyphase, single-phase and wound-rotor motors as well as totally enclosed fan cooled types. Also listed are the suggested new frame assignments for foot mounted and flange mounted motors, and standards for minimum locked-rotor torque for general purpose single-phase motors. [Published by: General Electric Co., Schenectady 5, N.Y.]

Oil Hoses

Illustrated eight-page booklet describes the types of hose produced for the oil industry by the manufacturer. Some of the oil hoses discussed are barge load-

ing, oil suction and discharge, butane-propane, fuel oil, gasoline pump, tank truck, tank car, etc. It contains cross section and cutaway photographs of products, descriptions of constructions, performance data, sizes, working pressures, lengths and weights, and recommended uses. Also included is information on oil hose fittings and instructions on connecting them to the hose. [Manufacturer: Quaker Rubber Corp., Div., of H. K. Porter Co., Inc., c/o W. M. Taylor, Adv. Mgr., Tacony and Comly Sts., Philadelphia 24.]

Pneumatic Spreader Stoker

Catalog 2530 contains information on the company's pneumatic spreader stokers for bituminous, sub-bituminous, high ash fusion and lignite coals. The text covers coal conveying, drying and pre-heating, and automatic firing. Material on automatic combustion controls, dumping grates, and the fly ash reinjection system is included. [Manufacturer: Iron Fireman Mfg. Co., 3170 W. 106th St., Cleveland 11.]

Power Exhausters

Bulletin 53-B contains complete dimensions and specifications for the firm's line of centrifugal wall exhausters, centrifugal and axial roof exhausters and back draft eliminators. Cutaway drawings and photographs show internal construction and proper installation. A sound level selection chart also is included. [Manufacturer: Jenn-Air Products Co., Inc., Architects & Builders Bldg., Indianapolis 4, Ind.]

Pressure and Vacuum Gages

Catalog 7001 describes many types of pressure and vacuum gages used to measure vacuums as great as 10-11 mm of mercury and pressures up to 150,000 psi. The catalog covers indicators, recorders, pneumatic and electric controllers and pneumatic transmission. Information is presented in tabular form for ready reference. [Manufacturer: Minneapolis-Honeywell Regulator Co., Industrial Div., Station 64, Wayne and Windrim Aves., Philadelphia 44.]

Pump Selection

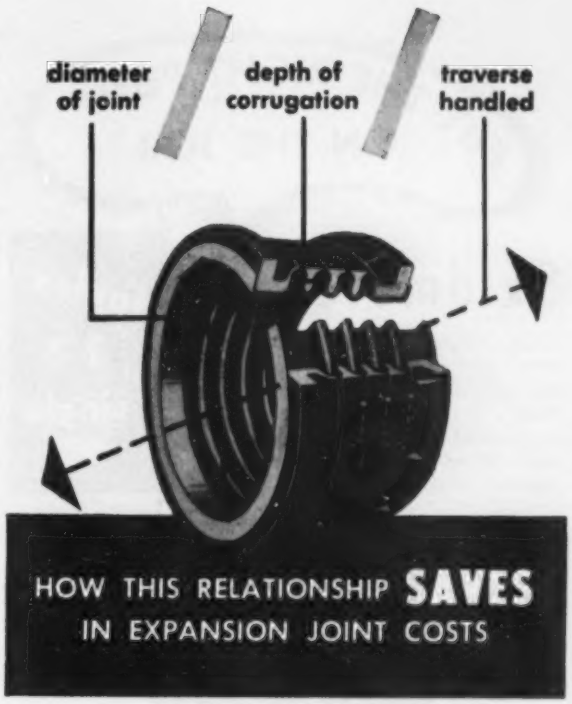
"A Practical Guide to Pump Selection," written by William F. Traudt, contains information on various types of pumps, their uses and limitations. Described are the rotary type, centrifugal and vertical centrifugal. Each type is illustrated. [Manufacturer: Taber Pump Co., 291 Elm St., Buffalo 3, N.Y.]

Refrigeration Controls

Bulletin No. 109 gives specifications and engineering details on the company's line of refrigeration controls. Described in detail is the application of mercury-bulb instrumentation down to −30 F. The bulletin covers recording, indicating or non-indicating instruments in the low temperature range. It describes application, operation, special features and a specially designed table for ordering. [Manufacturer: The Partlow Corp., New Hartford, N.Y.]

Rolling Scaffolds

Folder No. 52 on tubular steel rolling scaffold towers explains the application of the equipment



For each range of BADGER Expansion Joint Diameters, there is a carefully calculated depth of corrugation and a definite limit of traverse to be absorbed by this corrugation. The traverse is gauged to the depth of corrugation.

With four different corrugation depths, there is no need either to over-stress tube metal when forming the corrugation or to "over-traverse" the expansion joint installation in order to be sure of having ample capacity. The former assures longer joint life; the latter saves you in initial cost. You don't have to risk "under-traversing" the job. The joint, being just right for the job, means maximum life.

The more you study the Badger Expansion Joint—both the Self-Equalizing Directed Flexing and the Non-Equalizing Types—the more you will see and appreciate the careful engineering that has gone into these joints. And the more you study the work an expansion joint is to do, the more you will appreciate why sound engineering is a 'must' in expansion joints. You get it in Badger Joints.

BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE • MASS.

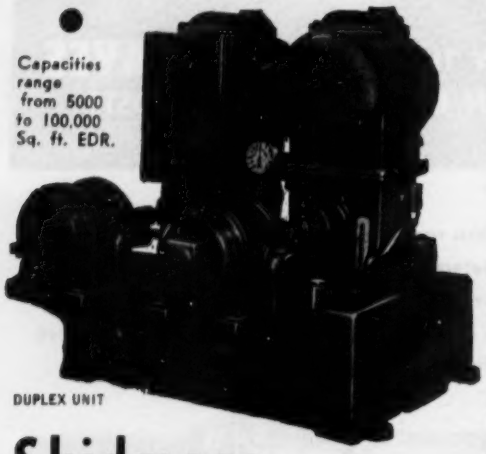
PUT THE RIGHT PUMP ON THE JOB

Skidmore

Vacuum Pumps remain constant year after year without adjustment or expensive repairs . . . priniciple of construction eliminates the necessity of close clearances between moving parts.

duplex ?? single

Capacities range from 5000 to 100,000 Sq. ft. EDR.

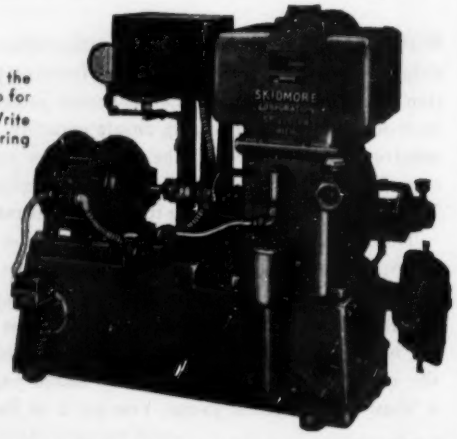


DUPLEX UNIT

Skidmore

Vacuum pumps operate automatically, quietly, economically and dependably under all normal conditions.

Skidmore has the RIGHT Pump for the job. Write for engineering bulletins.



SINGLE UNIT.

SKIDMORE CORPORATION, ST. JOSEPH, MICHIGAN

SKIDMORE PUMPS

for maintenance and construction work. A detailed description of the method of locking braces to panels and panels on panels with cam and stack locks is included. According to the bulletin, this method of maintenance scaffold assembly speeds up erection and dismantling through elimination of bolts, nuts, clamps and other methods of attachment. [Manufacturer: Advance Scaffold Div., Beaver Art Metal Corp., Dept. A, Ellwood City, Pa.]

Silver Brazing Pipe Joints

A recent issue of Low Temperature Brazing News describes the advantages of "Sil-Fos" silver brazing for pipe joints. Photographs show typical applications with a description of each installation. [Manufacturer: Handy & Harman, 82 Fulton St., New York 38.]

Starters for Motors

Bulletin 14B7132A describes 0-3 a-c across-the-line motor starters. Included are descriptions of manual and magnetic types of starters, combination and reversing starters as well as push button control stations. Operating arrangements are described and three types of enclosures are given. According to the bulletin, all starters are equipped with thermal overhead protection devices and the magnetic starters can be connected for either low voltage protection or low voltage release. A table shows motor voltage and motor maximum hp applicable to each of the four NEMA sizes of starters described. [Manufacturer: Allis-Chalmers Mfg. Co., 1171 S. 70th St., Milwaukee, Wis.]

Steam Traps

Two new publications offered by the manufacturer are Catalog No. 500, which is a general catalog on its line of steam traps, and Catalog No. 610 on the "Steam Line Flow" and "Universal" steam traps. Capacity and performance charts and engineering and design data are included in both booklets. [Manufacturer: Velan Engineering Ltd., 414 Darby Rd., Havertown, Pa.]

Steel Strapping for Insulation

This bulletin describes the advantages of fastening insulation with steel strapping. The type of strapping most suitable for each particular job is explained. Size, weight and type of strapping are shown in table form. Line drawings illustrate the models of stretchers and sealers that are available. Text describes the physical features of each model and suggests the type most applicable for specific jobs. Schematic drawings show how pusher bar tools tighten the straps. [Manufacturer: Acme Steel Co., 2840 Archer Ave., Chicago 8.]

Suction Centrifugal Pumps

Bulletin No. W-300-B4 covers the firm's line of standard and suction centrifugal pumps. The bulletin covers six types of pumps with varieties of mountings, frames and drives. Also included are charts to illustrate the coverage provided by the pumps in the SESC line. [Manufacturer: Worthington Corp., Centrifugal Pump Div., Harrison, N.J.]

Thermostatic Switch

Specification sheet contains data on the "Tempswitch" thermostat designed for use where sensitive control of temperature is required. Operation depends on expanding the tube housing with stationary internal

parts. Literature is available on conduction, convection and immersion types. Ranges are from −40 F. to 600 F. [Manufacturer: Smith Control & Instrument Co., Inc., Market St., Palmyra, N.J.]

V-Belt Power Transmission Guide

Engineering catalog on industrial v-belts and their applications contains the new increased horsepower ratings approved by the Rubber Manufacturers Assoc. The catalog also includes two new correction factors, length correction and small diameter factor for use in designing a v-belt drive. One section, including 23 tables, is devoted to revised pre-engineered drive tables for quick calculation. [Manufacturer: Durkee-Atwood Co., Dept. 411, Minneapolis 13.]

Vertical Pump Motors

Bulletin 1250 covers hollow and solid shaft vertical pump motors. The booklet shows the various types of enclosures available for these units and illustrates the uses for the motors in industry. Several cutaway illustrations and phantom drawings also show details of the non-reverse ratchet, types of oil and grease lubricated thrust-bearings available and specific features of motor construction. [Manufacturer: Louis Allis Co., 427 E. Stewart St., Milwaukee 7.]

Washers and Metal Stampings

Catalog and data book contains information on tension, friction and finishing washers; wire terminals; blanking dies; dished blanks; standard gages, general stamping; progressive and compound dies. Each type is illustrated in a variety of sizes and materials. Tabulated tables show specific dimensions. [Manufacturer: The Quadriga Mfg. Co., Dept. H4, 213 W. Grand Ave., Chicago 10.]

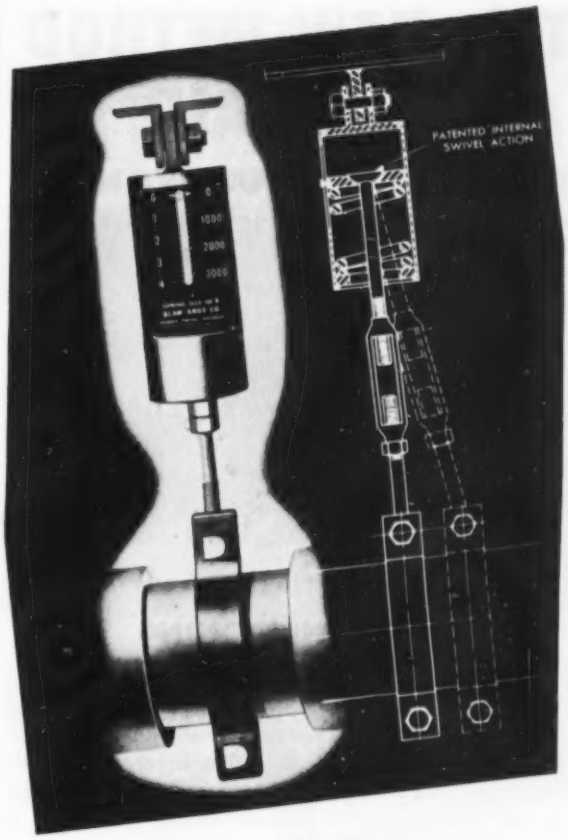
Water-Tube Steam Generators

Eight-page illustrated catalog contains data and specifications for factory assembled water-tube steam generators designed to provide automatic firing with oil, gas or stoker-fired coal. Cutaway diagrams illustrate internal operation. [Manufacturer: Superior Combustion Industries, Inc., Dept. W, 1475 Broadway, New York 36.]

Welding Fittings

Revision of Catalog W-3 includes text on and illustrations of "Weldolets," used in butt-welding and socket-welding, and "Thredolets," used for making threaded outlets. The 36-page ordering and engineering reference book provides sizes, weights and prices, installation data and a technical section covering design, engineering and material specifications. Reference graphs are given for code reinforcing requirements. Temperature-pressure ratings are also listed. [Manufacturer: Bonney Forge & Tool Works, 350 Green St., Allentown, Pa.]

AIR POLLUTION STUDIES—a series of three reprints published by the Industrial Hygiene Foundation. The reprints are "Scientific Boundaries in Air Pollution Studies," "Review of Latest Developments in Outdoor Air Pollution," and "Measurement of Air Pollution." Copies are available free of charge from the Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh 13, Pa.



"Ready-Made" for Any Piping Layout

To save engineering time and eliminate expensive cutting, threading and assembling in the field, just specify—

BLAW-KNOX HANGERS

Whether the installation calls for Rigid Hanger Assemblies, Functional Hangers, Vibration Eliminators or Overhead Roller Assemblies, you'll find each furnished as a complete unit designed to do the best job. Blaw-Knox pioneered in this field and has brought to it many improvements in hanger design—including the patent Internal Swivel Action which permits both lateral and longitudinal movement, while the hanger case itself remains vertical. Engineers who have solved some of the toughest hanger problems are available at all times to apply their experience to any installation that presents difficulties.

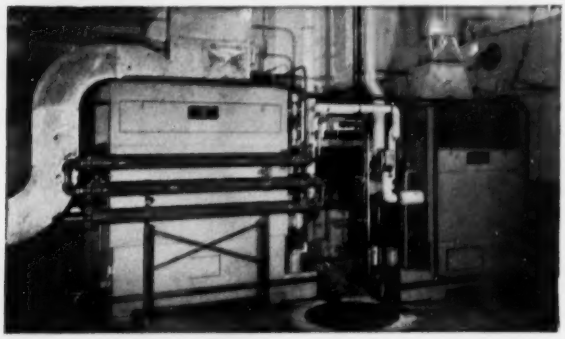
For complete technical data and time-saving information on hanger locating, send for Catalog No. 51.

BLAW-KNOX COMPANY
POWER PIPING AND SPRINKLER DIVISION
PITTSBURGH 33, PA.

BLAW-KNOX

This NEW METHOD DRIES AIR

PRECISELY AS YOU WANT IT



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

For complete information write

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. HP. 405 Lexington Ave. New York 17, N. Y.

Sales Engineers in Principal Cities of U. S. and Canada

WE HEAR THAT . . .

GENERAL CONTROLS CO. has announced plans for the construction of a new plant in Burbank, Calif., making this the third expansion during the past year. The new 120,000 sq ft manufacturing plant will house the company's Grayson-Greenamyer Appliance Control Div. Completion is scheduled for late this summer.

Construction of a modern one floor, completely air conditioned factory in Gainesville, Ga. has been announced by the *BRUNNER MFG. CO.* The company's board of directors chose the southern location because of its access to the large potential market for refrigeration and air conditioning equipment. A new corporation is being formed and all stock will be held by the Brunner Mfg. Co. of Utica. The new corporation will be operated as a subsidiary entirely separated in management affairs from the headquarters office.

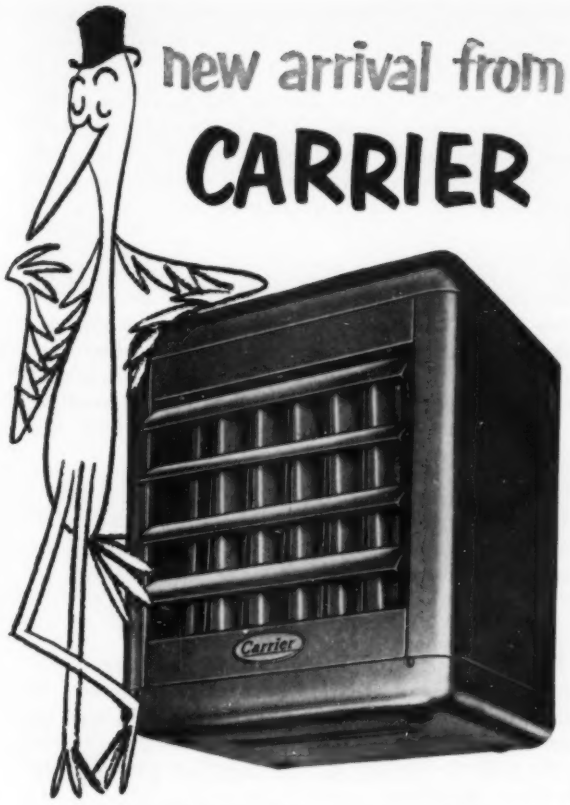
EDWARD F. OBERT, Northwestern University professor of mechanical engineering, received the eighth annual George Westinghouse award in engineering education at the annual banquet of the *AMERICAN SOCIETY for ENGINEERING EDUCATION* held at the University of Florida, Gainesville. The award, sponsored by the Westinghouse Education Foundation, is made to the outstanding engineering teacher in the United States and Canada under the age of 45.

AIR REDUCTION CO. recently used closed-circuit television in its exhibit at the American Welding Society show at Houston, so that a greater number of visitors would have a better view of the welding demonstrations. A portable, self-contained camera was placed in the welding booth and three large screen receivers were placed a short distance away. An aluminum welding booth housed the camera, welding equipment and operators and 11 pushbutton operated windows were lowered after each demonstration so that the welding operation could be inspected.

At the same meeting, Air Reduction demonstrated an experimental model of an aluminum pipe welding machine. This machine is designed for the field welding of aluminum gas gathering lines and oil transmission lines.

"It's In The Air," a new 20-minute color film telling the story of air conditioning, has been released by the *AIRTEMP DIV.* of *CHRYSLER CORP.* The principles of air conditioning are explained as well as how extreme heat and cold, humidity, dust particles, dirt and pollen affect people's lives. Another aspect of the film is its presentation of the story of the various atmospheres of the planets of the universe. Arrangements for showing may be made by writing to Airtemp Div., Chrysler Corp., 1600 Webster Ave., Dayton 1, Ohio.

The *DETECTRON CO.*, designers and manufacturers of electronic detection equipment, has announced completion of its new, air conditioned factory in North Hollywood,



new arrival from
CARRIER

...a small-package gas-fired Unit Heater with lusty lungs

It is only 23" high—yet it has a capacity of 50,000 Btu's per hour

COMPACTNESS is its special asset. It opens a vast additional market. It provides directional space heating (with space saving) facilities, available to thousands of low-ceiling stores, garages, service stations, diners, vestibules, entrances, etc.

SIMPLICITY is the key to its compactness. Gas is fired directly in the tubes of the leakproof one-piece heat exchanger, resulting in maximum heat transfer. *16* gauge ALUMINIZED STEEL is used for this one-piece heat exchanger. This *exclusive* Carrier feature adds years of service. Gas and fan shutoffs are completely automatic.

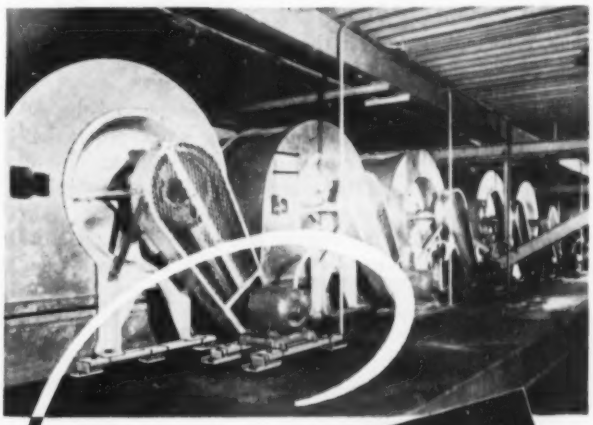
CARRIER GAS-FIRED UNIT HEATER 46T50 is typically Carrier engineered, handsomely styled, exceptionally quiet in operation and sturdily constructed. It is AGA-approved for all types of gas.

CARRIER GAS-FIRED UNIT HEATERS come in both propeller-fan and duct types, in 7 additional sizes up to 230,000 Btu's. For further information on these, as well as on the new model described above, write to Carrier Corporation, Syracuse, New York.

Carrier

AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING

STOP
VIBRATION



with KORFUND VIBRATION CONTROL

The photograph shows five of a total installation of 324 Clarage Heavy Duty Fans at The Upjohn Company's new pharmaceutical plant at Kalamazoo, Mich.

Korfund Twin Rail Bases under each fan and motor keep noise and vibration from reaching working areas through the steel deck or through the air conditioning ducts, and make possible this simple, space-saving installation on suspended platforms and structural steel members under the roof.

Korfund Duplex Twin Rail Bases have separate rails for fan and motor, and are completely adjustable—on the job—to take care of any drive center distance, motor position, bolt location or other variables. Built-in chocks assure positive alignment. Light weight, they are easier to handle. Base Drawings are immediately available for most fans and motors. And, because of standardization, long production runs reduce cost and permit quick deliveries.

For installation of fans, pumps, compressors, refrigerating and other types of mechanical equipment for both normal and critical operating conditions, basic isolation recommendations are given in Bulletin No. 15. Write for your free copy today, or see our catalog in Sweet's Files. Write, too, for one of our free Belt-Center Distance Calculators—it's a real time saver.

If you have a specific problem, we will be glad to submit recommendations without obligation. A half century of experience is at your disposal. Representatives in principal cities.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

Calif. The new building will provide larger research facilities and will double the production capacity for the company's line of pipe metal and leak detection equipment, Gieger counters, etc.

The Chicago office and laboratories of the *BJORKSTEN RESEARCH LABORATORIES, INC.*, have been moved to 1525 E. 53rd St. *DR. EDWIN L. GUSTUS*, vice president, will continue to head this branch.

The *LINCOLN ELECTRIC CO.* has announced the establishment of a new division using mass production techniques for the reconditioning and rebuilding of arc welding equipment. Known as the Linc-conditioning Div., it will rebuild for users of Lincoln equipment, their engine driven motor generators and a-c welders, in production lots. The new division is under the supervision of *ROBERT DALZELL*.

TACO HEATERS, INC., recently held a two-day sales meeting in Providence, R.I., on company products and manufacturing, and sales techniques. The meeting was attended by the regional sales staff and home office management.

Thirty-three major railroads have purchased *VAPOR HEATING CORP.'s* new "Moduzone" and "Unizone" steam heating systems for 745 coaches, sleepers, diners and other types of passenger cars, according to an announcement by *L. H. GILLICK*, vice president in charge of sales.

The *McINTIRE CO.* is now in full operation at its new plant recently completed at Livingston, N.J. The new plant provides approximately 15,000 sq ft of working space. In addition to increased plant capacity, complete laboratory facilities have been installed.

The *NATIONAL SAFETY COUNCIL* has just published the 1953-54 edition of the National Directory of Safety Films. The directory provides the plant safety man with a comprehensive listing of 963 motion pictures and slide films for use in training personnel in occupational accident prevention. Copies of the directory are available at 75 cents each from the National Safety Council, 425 N. Michigan Ave., Chicago 11.

Construction has begun on a new plant for *EUTECTIC WELDING ALLOYS CORP.* in Flushing, N.Y. for the increased production of electrodes and welding alloys. A production line 273 ft long will be installed.

WESTINGHOUSE ELECTRIC CORP. has begun construction for a new electrical research center located 10 miles east of Pittsburgh. The new center, scheduled for completion in early 1955, will be approximately one-third larger than the present facilities and will provide room for future expansion.

PENN DYNAFANS

GIVE VENTILATION PROBLEMS THE AIR...

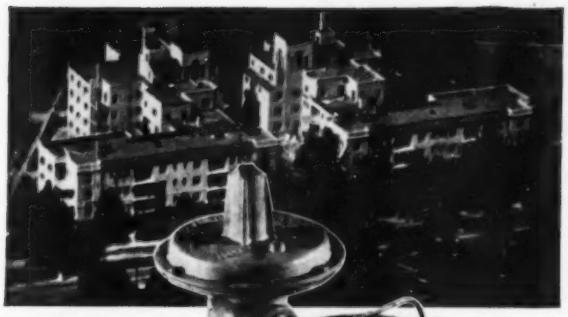
No doubt about it—Penn Dynafans increase employee efficiency in your customer's plants by exhausting the "hot spots." This rugged unit can be depended upon to handle the toughest ventilation problems . . .

- Motors out of the air stream, safely remove dust, heat, fumes, vapors, etc.
- Economical to install and operate.
- Sizes range from 250 c.f.m. to 30,000 c.f.m.
- Pulling power is positive and units will not overload regardless of resistance.
- Units are quiet running and have a low clean silhouette.

Write for complete literature today.
Representatives and Distributors in Principal Cities.

PENN VENTILATOR CO.
PHILADELPHIA 40, PENNSYLVANIA

FOR MORE THAN 25 YEARS THE BUILDERS' ROOF TOP LINE!



Lo-BLAST Burners heat this huge Cincinnati apartment building.

FOR EVERY TYPE OF BUILDING

LO-BLAST

IS THE LOW-COST WAY TO HEAT WITH GAS

Every dollar trimmed from operating expense shows up on the profit side of the ledger. That's why fuel-saving Lo-BLAST Power Gas Conversion Burners are the sensible selection for buildings which must produce income . . . or for home owners concerned with keeping living costs down.

Lo-BLAST operating cost averages 10% less

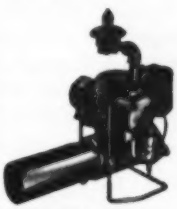
The Lo-BLAST principle of combustion utilizes an extremely quiet, low speed blower to provide perfectly controlled primary and secondary air. Hence operation is always independent of natural draft conditions—makes the Lo-BLAST ideal for down-draft boilers. Combustion is completed in an incandescent firebox, with radiant heat applied to the crown sheet as well as side walls. There's no combustion roar—the flame is soft and *quiet!*

High efficiency on intermittent operation

Lo-BLAST Burners show only a small drop in over-all efficiency when changing from constant to intermittent operation. This is the reason for Lo-BLAST fuel economy, since intermittent operation is the normal condition for any heating plant.

Factory-tested on gas, shipped completely assembled

Installation and servicing are easy *because there's nothing in the firebox but the fire!* All units have standard controls with positive acting pilot and blower safetys.



Lo-BLAST Economite
Residential size — 70,000 to 300,000 BTU—with all the fuel-saving features of the standard Lo-BLAST.

Capacities from 70,000 to 20,000,000 BTU input. Write for engineering data.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

LOOK TO Jacuzzi ... FOR ECONOMICAL ALL PURPOSE

CENTRIFUGAL PUMPS

PRECISION ENGINEERED for air conditioning and hot water circulating

Get the facts!

Write for detailed bulletin "JGP-2."

You can count on Jacuzzi's compact, dependable utility pumps for jobs like circulating water in air conditioning systems, food processing plants, cooling towers, swimming pools...ideal, too, for sprinkling lawns and hot water circulating.

Can be mounted at any angle with six different discharge positions. Horsepower ratings from ¼ through 5 H.P. Electric motor, belt or gas engine drive.

Low cost. Simple in design. Highly efficient. Each unit built with the same engineering know-how and ruggedness that has made Jacuzzi the world leader in centrifugal-jet pumps. Don't settle for less.

Jacuzzi BROS. INC.
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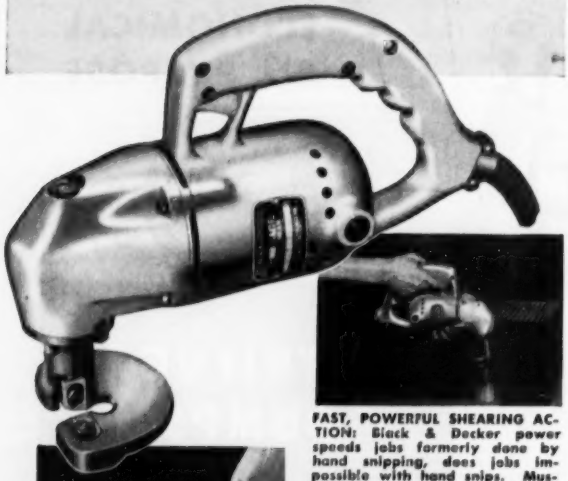
Also:
St. Louis 23, Missouri · Binghamton, New York
Portland 14, Oregon · Monterrey, Mexico

Throw away your snips!

Switch to Black & Decker Electric PORTO-SHEARS* for faster, easier, more accurate cutting!



FAST, POWERFUL SHEARING ACTION: Black & Decker power speeds jobs formerly done by hand snipping, does jobs impossible with hand snips. Muscular strain is a thing of the past!

CUTTING OPERATION ALWAYS VISIBLE: Follow straight lines, irregular patterns and curves down to small radius easily with Porto-Shears. Visible operation keeps rejects to a minimum.

CUTS MANY MATERIALS: steel, galvanized iron, Monel, stainless, copper, aluminum, lead, and other non-ferrous metals. Adaptable to thin sheets of laminated wood or sheet plastics.

Once you've used a B&D Electric Porto-Shear, you'll never want to go back to slow, tedious hand snips. B&D Porto-Shears cut sheet metal too tough for snips! They speed up jobs where snips are slow . . . save time and cut costs on hundreds of jobs. . . eliminate muscular strain. Like all B&D tools, Porto-Shears are made with husky housings, top-quality parts. Two models, in capacities for 16-gage and 12-gage steel. See your nearby Black & Decker Distributor for demonstrations of these and other famous B&D Tools. Write for free catalog to: THE BLACK & DECKER MFG. CO., 640 Pennsylvania Ave., Towson 4, Md.

*Trade Mark Reg. U. S. Pat Off.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

DRILLS SANDERS BENCH GRINDERS HAMMERS

WHO'S WHAT . . .

ALBERT H. BORCHARDT has retired as vice president of *WORTHINGTON CORP.* after service with the company for 44 years. During this period of time, Mr. Borchardt has been connected with many departments of the company. In July 1951 he was appointed vice president of the corporation.

The Export Div. of *CHRYSLER CORP.* has appointed *E. A. MISHLER* as assistant Airtemp sales manager. Mr. Mishler has been with the company since 1941. He was transferred to the export division in 1947 and since that time has assisted in the development of foreign markets for the firm.

WILLIAM G. WRIGHT has been named a executive assistant to Pres. H. S. Marshall of the *C. A. DUNHAM CO.* Most recently he was manager of marketing at Panellit, Inc.

INTERNATIONAL NICKEL CO., INC. has announced the appointment of *JOHN V. MORAN, JR.* as section head of the special publications section.

RELIANCE ELECTRIC & ENGINEERING CO. has announced several new appointments. In the firm's new central production-planning unit in the manufacturing department at Cleveland, personnel for the new positions are: *HUGH D. LUKE*, department manager; *JAMES A. BRANDT*, assistant department manager. At the Ashtabula plant *A. S. TUSIN* is superintendent; *ROBERT B. ADAMS* is night superintendent; and *HENRY C. DETTENMAYER* is production manager.

RONALD PAGE of Colchester, England, has been appointed night factory manager of the firm's home plant of the *TORRINGTON MFG. CO.*

CARL L. ERWIN has been appointed assistant works manager of *EDWARD VALVES, INC.*, a subsidiary of the Rockwell Mfg. Co. Mr. Erwin was formerly personnel manager and in his new position will continue to take an active part in employment affairs and industrial relations with emphasis on the broadening of the company's employee training program.

D. E. INMAN has been appointed engineering manager of general industrial products by *WESTINGHOUSE ELECTRIC CORP.* Mr. Inman has been with the company since 1925 and has most recently been located at the Chicago office as district engineering and service manager for the firm's northwestern district.

OMEGA MACHINE CO., Div. of Builders Iron Foundry, has elected *PAUL A. COFFMAN* vice president of the firm. Mr. Coffman will continue as a director of the company and also as chief engineer along with his new position.

GET MORE OUT OF YOUR SPRAYING EQUIPMENT WITH LESS POWER

For spraying, washing, rinsing, cooling and air conditioning, Yarway Spray Nozzles will improve the efficiency of your spray equipment.

There are no internal vanes or other restrictions to clog or hinder the flow.

Cast bronze Involute-type

Bar stock Involute-type

Bar stock Fan-spray-type

Yarway Spray Nozzles are available in two types—the Yarway Involute producing fine hollow cone spray with minimum energy loss, and the Yarway Fan-spray for flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Made of metal castings or machined from solid bar stock.

The 20-page Yarway Spray Nozzle Bulletin contains not only complete details on Yarway Spray Nozzles and Fittings, but also much helpful information on the many uses for spray nozzles. Ask for a free copy—Bulletin N-617.

YARNALL-WARING COMPANY

107 Mermaid Ave., Philadelphia 18, Pa.

YARWAY / spray nozzles

O.K. to Re-order

For Commercial, Industrial and Institutional Installations

Sizes 1 to 60 gph capacity. Only oil burner designed especially to burn No. 5 oil without preheating. Gas, combination gas/oil burners also available.

Fuel savings up to 30% make HEV-E-OIL Burner *best buy* for you!

No wonder HEV-E-OIL Burner customers are *repeat* buyers! Hundreds of commercial and industrial buyers say HEV-E-OIL Burners helped them save up to 30% on fuel costs by *burning thrifty heavy oils.* Here's what typical owners* say:

"— since installing your HEV-E-OIL burners, we have been using the No. 5 grade oil, this has saved us approximately $900.00."

"— we formerly used 30,000 gallons of light oil per year. Now, with Cleaver-Brooks HEV-E-OIL Burners, we only consume 25,000 gallons of No. 5 oil, which gives us a saving of $700.00 per year."

*Names on request

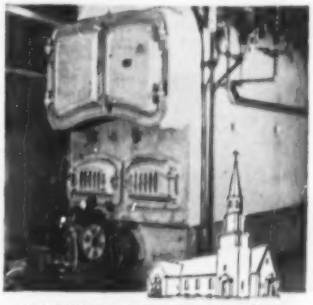
Here's how to get started cutting heating bills 30%

1 Add up your present heating bills — then deduct 30%. This is your approximate saving with HEV-E-OIL Burner.

2 Write for Bulletin AD-102—highly illustrated, with more fact-packed reasons why it will pay you to convert to HEV-E-OIL.

3 Get in touch with your Cleaver-Brooks HEV-E-OIL dealer — he will be glad to make a free survey without obligation.

REMEMBER . . . if you are using 6,000 gals of oil, or more than 45 tons of coal per year — the HEV-E-OIL Burner is the *best buy* for you! Write direct for name of dealer nearest you.



HEV-E-OIL Burner installed at Bay Shore Lutheran Church, Milwaukee, Wis.

Cleaver-Brooks

BURNER DIVISION • CLEAVER-BROOKS COMPANY

Dept. J, 381 E. Keefe Ave., Milwaukee 12, Wisconsin

AMERICAN WHEELABRATOR & EQUIPMENT CORP. has announced several new appointments: For the company's home office in Mishawaka, Ind., *ROBERT L. ORTH* has been appointed field sales manager; *JULIUS E. SKENE* is now manager of customer service; and *PHILIP R. JORDAN* is chief sales engineer. *GORDON R. BRYANT* is district manager of the Detroit office with *JOHN W. SWANTZ* as district sales engineer and *ERWIN C. SHEPARD* as service engineer. *F. H. TOMAN* is district sales engineer of the Chicago office. *J. DOUGLAS* is district service engineer for the Toronto office. *WILFRED G. CARRIE* is district manager of the Seattle office, and *GEORGE C. TOLTON*, formerly Seattle district manager, has been appointed district manager of the Greensboro, N. C. branch.

The board of directors of *CRANE CO.* has announced two new appointments: *LUCIEN W. MOORE* was elected vice president and *GEORGE L. LARSON* was appointed executive assistant at a recent meeting. Mr. Moore is the director of purchases for the company and Mr. Larson is general superintendent of the Chicago works.

The *OHIO INJECTOR CO.* announces three new appointments: *HARRY C. BELL* has been appointed manager of engineering sales representing sales managers in decisions on new product design; *PAUL E. WARNER* has been named manager of sales promotion; and *P. J. GALLAGHER* is now sales manager of the Atlantic Div. replacing Mr. Warner.

RAY THOMAS has been elected to the board of directors of the *VIMASCO CORP.* and appointed as executive vice president and general manager of the firm.

NORMAN W. FOY has been named vice president in charge of sales of the *REPUBLIC STEEL CORP.* He replaces *J. M. SCHLENDORF*, who will retire from this position but will continue with the corporation in a consulting capacity on sales problems. *L. S. HAMAKER* is general manager of sales with *S. A. CRABTREE* as assistant general manager of sales in the firm's Chicago district. *R. W. HELMS* has been appointed assistant general manager of sales for the entire company.

New appointments for the Berger Mfg. Div. of the corporation include *CHARLES E. HOWES* as general manager of sales. Succeeding Mr. Howes as manager of sales of the steel equipment division is *D. E. GEORGE*. *A. C. RUDY* now is manager of the New York sales branch for the division.

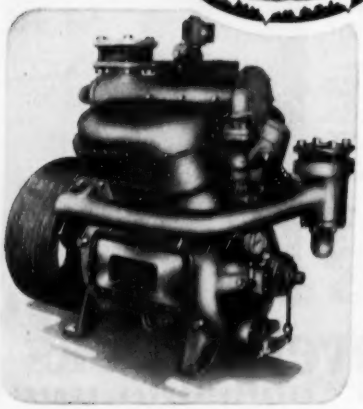
EDGCOMB STEEL CORP. has elected *CHARLES K. MUNN* as vice president and treasurer of the company. Mr. Munn was formerly treasurer. He has been with the firm for 26 years and at one time was sales manager of the company.

HERBERT N. EATON, recently retired as chief of the hydraulics section of the National Bureau of Standards, has been retained as a technical consultant to the Research

PILOTLESS BOMBERS MADE WITH

TRADE FRICK MARK®

AIR CONDITIONING



The Glenn L. Martin Company, builders of "Matador" bombers, "404" transports, and other famous planes, uses 27 Frick compressors for air conditioning and special cooling services in its great plant at Middle River, Md. These machines have been installed over a period of 16 years by the Paul J. Vincent Co., Frick Distributors in Baltimore.

For the last word in dependability and convenience, specify Frick air conditioning, refrigerating, ice making and quick freezing equipment. Let us quote on your cooling needs NOW.

Frick "ECLIPSE" Compressors Handle Air Conditioning Work with Extra Economy: ask for details.

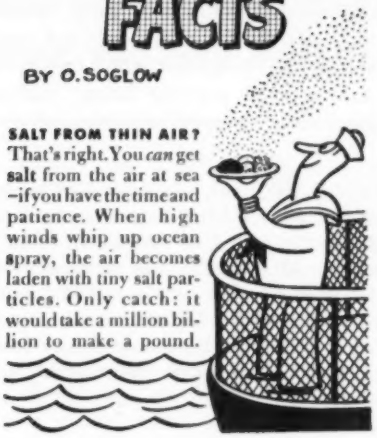
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

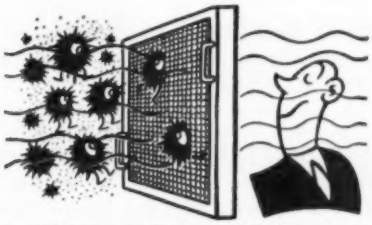
AIR-MAZING FACTS

BY O. SOGLOW



SALT FROM THIN AIR? That's right. You *can* get salt from the air at sea—if you have the time and patience. When high winds whip up ocean spray, the air becomes laden with tiny salt particles. Only catch: it would take a million billion to make a pound.

SOUND IDEA FOR DIESELS. Noisy diesel air intakes cause employee fatigue and annoy neighbors. But Air-Maze filter-silencers hush the racket while they clean the air.



BAD AIR GETS FRESH START! Air-Maze panel filters keep damaging dust and grit out of engine rooms, diesel locomotive cabs, offices, etc. They're all-metal, cleanable, have high dirt-holding capacity and low pressure drop. Available in a wide variety of types and sizes.

WHETHER YOU BUILD OR USE engines, compressors, air-conditioning and ventilating equipment, *or any device using air or liquids*—the chances are there is an Air-Maze filter *engineered* to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 28, Ohio.

AIR-MAZE

The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

SERVING THE HEATING INDUSTRY SINCE 1926

Yula

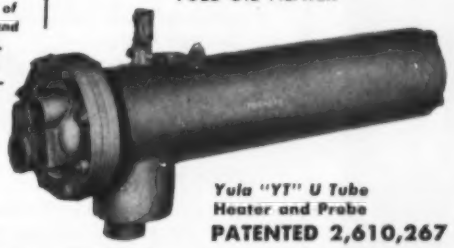
A Complete Line of Dependable Heat Exchangers

Yula-trol Relay box and alarm

Get DOUBLE* PROTECTION for your oil burner installations with . . .

Yula-trol
FUEL OIL DETECTOR
and
Yula "YT" "U" Tube
FUEL OIL HEATER

***Approved** by New York City Board of Standards and Appeals. No. 367-50-S.A.*



Yula "YT" U Tube Heater and Probe
PATENTED 2,610,267

* **Protects system from serious damage, in case of an oil leak in the Pre-heater, by shutting off oil burner, sounding an alarm, flashing on a red light.**
* **Acts as a Low Water Cut-off**

RESULT: Heating System protection at low cost

OTHER *Yula* PRODUCTS

TYPE "M" MIXING VALVE Automatically mixes hot and cold water or other fluids. Delivers it at any predetermined constant temperature.

INSTANTANEOUS HEATERS . . . Ideal for domestic and industrial applications where large volumes of hot water or other solutions are needed for service water supply or process work

CONVERTERS . . . For water in tubes, steam in shell, or water to water applications. "U" tube bundle construction simplifies cleaning.

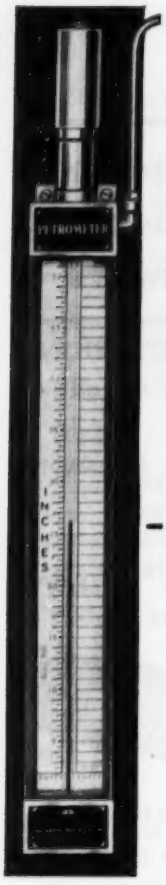
DRY EXPANSION FREON COOLERS . . . Designed for air conditioning, refrigeration, and industrial and process uses for cooling water or other liquids.

A.S.M.E. CONSTRUCTION

The Yula Engineering Staff is at your service

YULA WATER HEATERS, INC.
166 WEST 225th STREET, NEW YORK 63, N.Y.

MEMBER FUEL OIL AND WATER HEATER MANUFACTURERS ASSOCIATION



PETROMETER
REMOTE READING
LIQUID DEPTH GAUGES

"Bring Your Liquid Level to Eye Level"

THE BEST GAUGE FOR:

Commercial and Industrial Fuel Oil Storage Tanks

Domestic Installations with Buried Tanks

Storage Tanks for other Industrial Liquids—gasoline, solvents, acids, etc.

HERE'S WHY:

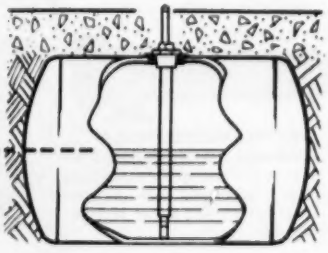
Can be installed on tanks above or below the ground and up to ¼ of a mile away.

No troublesome moving parts—operates on the principle of the U-tube. Simple, dependable and accurate.

Large, easy-to-read vertical scale gives tank contents at a glance. Scales are easily changed for different liquids.

Easy to install—the tank assembly for the gauge can be installed when the tank is empty or when containing liquid. It can also be installed separately to complete the tank work. The gauge can be connected any time later. Only one simple connection to tighten.

WRITE FOR BULLETIN PH TODAY.



FOR TANKS 20 INCHES TO 50 FEET DEEP.

LIQUIDEPTH INDICATORS, INC.
43-22 TENTH STREET
LONG ISLAND CITY 1, N. Y.

Committee for the *BITUMINIZED-FIBRE PIPE INDUSTRY*. He is a representative of Orange Mfg. Co., Inc., Brown Co., and Line Material Co. His offices will be at Chevy Chase, Md.

VICTOR W. SMITH has been appointed production manager of the *BUSH MFG. CO.* Mr. Smith was with C. V. Hill Co. as chief engineer before joining Bush in 1945.

WM. STEINEN MFG. CO. has announced the appointment of *ROBERT W. HUNDLEY* as assistant sales manager to work directly with *LAWRENCE E. KNAPP*, who is sales manager. Mr. Hundley was previously employed with the Delco Appliance Div. of General Motors Corp. as zone representative. *JESSE TANKEL* has been appointed general manager of the Oil Burner Accessory Div. of the firm. Mr. Tankel has been with the company for many years.

H. L. INGRAM, JR. has been appointed manager of the Technical Development Dept. of the *AIR REDUCTION SALES CO.* Mr. Ingram has been with the company for 18 years and was most recently a special representative with offices in Washington, D. C.

HARRY L. WILLIAMSON, JR. has been appointed manager of marketing of the heat pump department of *GENERAL ELECTRIC CO.*

R. L. SCHUTTE has been appointed sales manager, *P. H. STAERK*, advertising manager, and *J. E. DAVIS*, assistant treasurer of the *AHLBERG BEARING CO.*

CHARLES T. McCLURE has been appointed assistant manager of oil country tubular sales for the *YOUNGSTOWN SHEET & TUBE CO.*

KAISER ENGINEERS has established an Atomic Energy Div. with *J. H. HAYNER* as division manager. Mr. Hayner was formerly with the Atomic Energy Commission. *P. D. BUSH* has been appointed assistant division manager.

JAMES J. LaSALVIA was elected president of the *OSBORN ENGINEERING CO.*, Cleveland, at a recent meeting of the board of directors. He has been with the firm since 1919. Other officers elected are: *HOMER T. BORTON*, vice president; *NOBLE W. HERZBERG*, secretary; *RALPH E. SCOTT*, treasurer; and *VERNARD H. KOTZ*, assistant treasurer.

The *KENNARD CORP.* has appointed *KELL T. TODD* as plant manager.

The *REFRIGERATION and AIR CONDITIONING CONTRACTORS ASSOC.* has elected *RAY KROMER* as

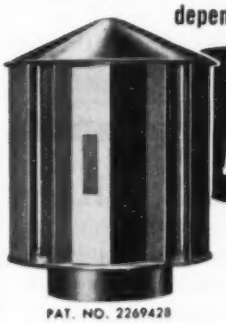
Now you can **BE SURE** when you *buy ventilators*

The Breidert Air-X-Hauster gives you *certified capacity ratings* based on directional wind tests. Ventilator capacity ratings usually are based on horizontal wind tests only. In actual use ventilators must perform with winds blowing at ANY angle. Capacity ratings of most ventilators are not certified. Performance does not equal ratings claimed in some cases.

The Breidert Air-X-Hauster is the first ventilator to be tested by a nationally known independent testing laboratory* under variable wind conditions, and to have certified ratings published. Thousands of large and small industrial users have found that Breidert Air-X-Hausters perform as claimed in every respect.

**By Pittsburgh Testing Laboratories*

For tested and certified performance you can depend on the

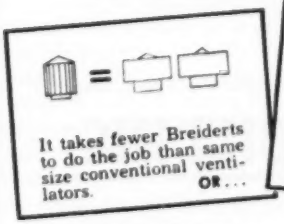


PAT. NO. 2269428

Breidert Air-X-Hausters

Breidert Air-X-Hausters provide safe, sure ventilation no matter which way the wind blows (barring interior negative pressures). Stationary, down-draft proof, no moving parts, nothing to jam or get out of order. It is not necessary to cover Breidert Air-X-Hausters with tarpaulin or bags to keep out rain or snow.

THE BREIDERT AIR-X-HAUSTER DELIVERS BETTER ALL-AROUND RESULTS

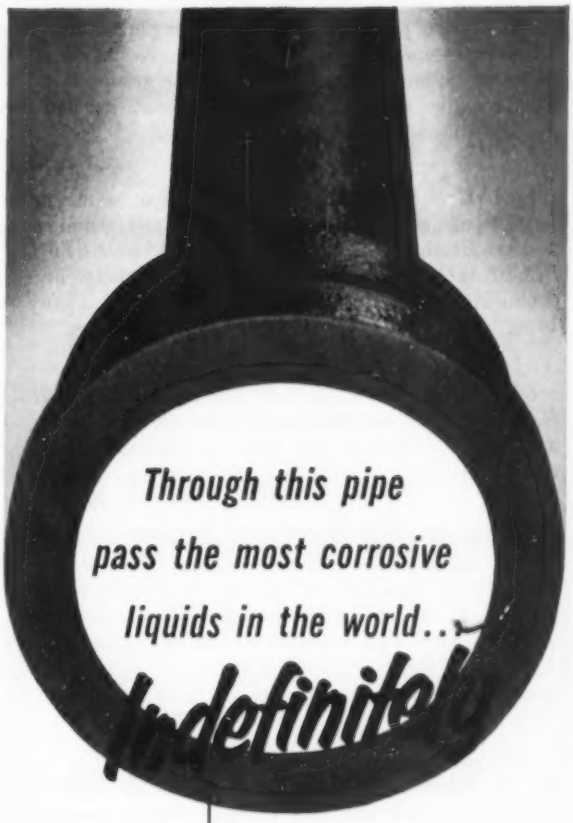

It takes fewer Breiderts to do the job than same size conventional ventilators.
OR...
You can use the same number of smaller size Breiderts to do the same job as conventional ventilators.

GET ALL THE FACTS! Write today for complete Engineering Data Book, including certified capacity ratings. Address Dept. A.

THE G.C. BREIDERT Co.

3129 SAN FERNANDO ROAD, LOS ANGELES 65, CALIFORNIA

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES



Install DURIRON acidproof drain pipe

Duriron is a high silicon iron alloy with very high resistance to most commercial acids at practically all concentrations and temperatures. Resistance is as thick as the pipe wall itself.

Duriron is installed by the same plumbing methods as ordinary cast iron soil pipe. BUT . . . in most cases this is the *last cost*, since Duriron will generally outlast the building.

Available in standard fittings, Duriron is widely used in schools, hospitals, industrial plants, battery stations, emergency lighting plants, kitchens—wherever corrosive waste disposal is a problem. Write for Catalog PF/1.

DURIRON

LOOK FOR THIS NAME ON EVERY PIECE

THE DURIRON COMPANY, Inc.
402 North Findlay Street
DAYTON, OHIO

executive vice president to head the organization's new five year comprehensive program. Mr. Kromer was responsible for organizing local contractor groups throughout the nation to form the original organization and was the first chairman of the association.

FRANK R. COOK has been appointed to the newly created position of director of reasearch and planning for the Aeronautical Div. of *MINNEAPOLIS-HONEYWELL REGULATOR CO.* Mr. Cook has been director of aeronautical engineering since he came to the company in 1950.

ORANGEBURG MFG. CO. has appointed *ROBERT HARRINGTON* as director of new products development. Mr. Harrington was formerly associated with General Electric Co.

TRANE CO. has announced several new appointments in the home office sales departments: *WILLIAM C. DACKIS* is manager of process heat transfer sales; *JAMES R. WHALEN* is manager of convector sales; *TED W. ERNST* is manager of coil sales; and *LLOYD E. EATER* will handle the fluid cooler division of the heat transfer sales department.

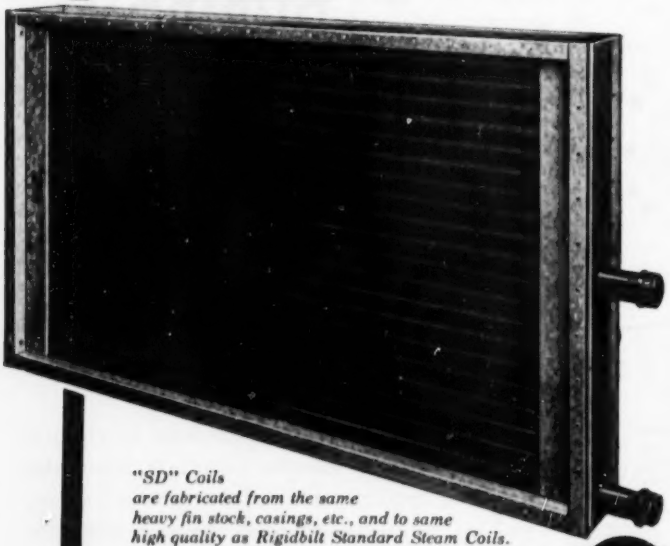
Announcement of several changes of personnel for the *W. H. BRADY CO.* has been made. *WESTLEY J. TUITE,* who was formerly Chicago district manager, is now general sales manager of the company with offices in Milwaukee. *FRED C. KLUHSMAN* is now Chicago district representative. *JOSEPH I. STONE,* who was formerly eastern district representative, is now eastern district manager with headquarters in Newark. *PAUL J. LEONARD* now is mideastern district representative with headquarters at Philadelphia.

W. TOM MOORE has been appointed an executive assistant in the Atomic Power Div. of the *BABCOCK & WILCOX CO.* He has been with the company since 1926, and has been engaged in development and design work for the company during most of this period. In 1946 he was assigned to Oak Ridge National Laboratory, and in 1948 he was transferred to the Argonne National Laboratory.

WILMOT F. WHEELER, JR. has been appointed assistant to *C. N. JOHNS,* president of *AMERICAN CHAIN & CABLE CO., INC.* and associate companies, with headquarters at 230 Park Ave., New York. He has been with the company for the past two years working on special assignments.

DR. FINN J. LARSEN has been appointed director of research for *MINNEAPOLIS-HONEYWELL REGULATOR CO.* A member of the company's research and engineering organization since 1948, he succeeds Dr. Waldo Kliever, who has resigned. Dr. Larsen joined the com-

RIGIDBILT STEAM DISTRIBUTING TUBE HEATING COILS



For heating jobs where regulated steam control is needed, RIGIDBILT Steam Distributing Coils are ideal. Uniform steam distribution is provided throughout entire length of coil, even when low throttled. Coils consist of 2 separate sets of tubes, one within the other, spaced by separators, and each free to expand or contract. Special construction keeps condensate warm.

RIGIDBILT IS BETTER BUILT—Write for Catalog

RIGIDBILT INC.

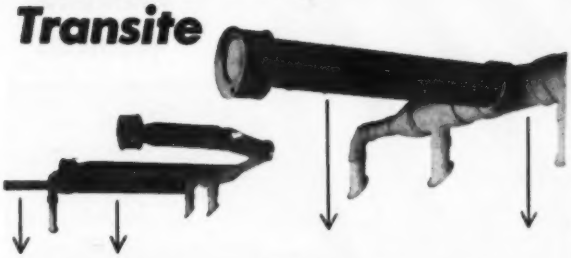
2832 W. FULTON ST., CHICAGO 12, ILLINOIS

"SD" Coils are fabricated from the same heavy fin stock, casings, etc., and to same high quality as Rigidbilt Standard Steam Coils.

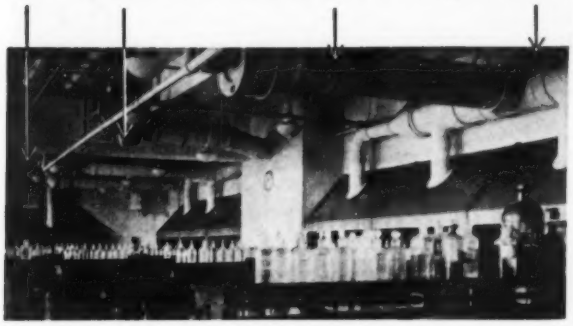
FAST DELIVERY!

AIR CONDITIONING & VENTILATING UNITS • UNIT & PRODUCT COOLERS • HEATING & COOLING COILS
ALSO COILS DESIGNED AND BUILT FOR SPECIAL APPLICATIONS

SOLVED with Transite



. . . a tough problem of venting corrosive fumes and gases



because TRANSITE INDUSTRIAL VENT PIPE *is corrosion-resistant, long-lasting*

HERE are 3 good reasons why the Transite* Industrial Vent Pipe shown here can be expected to keep down the costs of venting aggressive gases in the laboratory, and to do it for a long time to come:

1. **It's made of asbestos and cement—cannot rust or rot.**
2. **It needs no painting or any other preservative finish —ever—whether used indoors or out.**
3. **It is resistant to practically all corrosive fumes, mists and gases.**

Transite Industrial Vent Pipe—as vents, ducts, stacks for indoor or outdoor use in laboratories and industrial plants—is adaptable to practically any requirement. It is quickly and economically installed. It is light, strong and durable . . . is easy to assemble . . . can be worked with ordinary tools. It comes in sizes up to 36″ in diameter, and there is a complete line of fittings available for every need. For further details on Transite Pipe for your industrial venting problems, write to Johns-Manville, Box 60, New York 16, N. Y.

JM

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE Industrial Vent PIPE

Panqborn

UNUSUAL OPPORTUNITIES FOR

DUST CONTROL ENGINEERS IN RAPIDLY EXPANDING FIELD WITH ESTABLISHED TOP RATED ORGANIZATION

● DESIGN and DEVELOPMENT ENGINEER

Design and Development Engineer experienced in dust handling systems, design of industrial dust and fume control and collecting equipment. Position requires initiative, technical ability and experience to develop, design and test practical, marketable equipment; from his ideas and those of others. Must have successful record designing industrial equipment.

● APPLICATION ENGINEER

To survey and study industrial plant conditions, prepare recommendations for dust and fume control including system design, layout and calculation, equipment selection, cost estimates. To establish application engineering practices on control systems and equipment. Investigate new application fields. Duties involve some field work.

● EXPERIMENTAL and TEST ENGINEER

For laboratory and field experimental and test work on industrial dusts and fumes and control equipment. Experience in air flow testing, dust sampling and counting, particle size analysis and industrial hygiene preferable. Some field test work. Prefer graduate engineer with laboratory or industrial experience in similar work.

Excellent working conditions; paid vacation and holidays; group life insurance; sickness and accident benefits; employee's profit sharing plan; family hospitalization and surgical plan. Good schools and ideal suburban living.

Replies confidential. State education, experience, age, expected starting salary.

Please address
Mr. W. O. Vedder, Mgr., Dust Control Dept.

Panqborn CORPORATION

HAGERSTOWN, MARYLAND

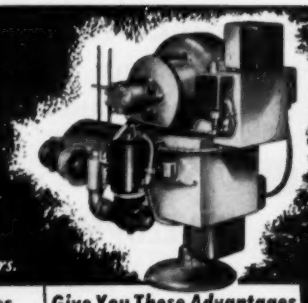
Now! A DUAL FUEL BURNER

Engineered To Insure Peak Efficiency With Both Fuels

GAS and OIL

Siemon Power Combi-Matic Burner
employs the forced-draft principle
for firing on both gas and oil.

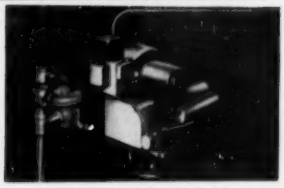
SIEMON Bonus Built* Burners



offer more to you . . .
more to your customers.

*Bonus Built Features...	Give You These Advantages
Factory Assembled	Less installation time required.
Factory Tested—for Both Gas and Oil	Insures top "on the job" performance.
Automatic Air Adjustment	Just set it . . . forget it . . .
Motorized Gas Valve	Quiet start-ups; actuates air dampers to correct position.
Automatic Ignition Transformer	Automatic ignition for BOTH fuels.
Uses Standard Controls	Parts always accessible immediately.
Electronic safeguard	Immediate response to flame interruption.
Pressure Safety Control	Prevents opening of either fuel valve unless fan is running and pump pressure proven.
Optional Automatic or Manual Changeover	Will switch automatically from outside temperature or by the flip of a switch.

Model FGO-2200-E
Boiler fired at 2,000,000 B.T.U. input—gas and oil installation in a large Midwestern paper distributing plant



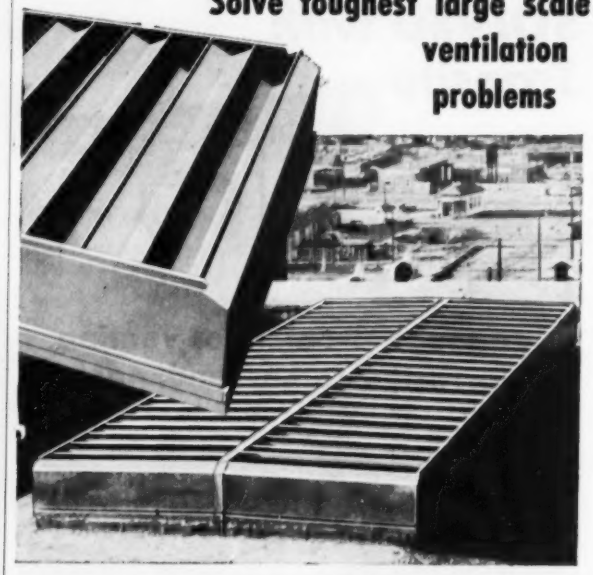
Siemon
Power Combi-Matic
DUAL FUEL BURNERS

Siemon Manufacturing Co.
1819 Holmes, Dept. T Kansas City, Mo.

Please rush literature and "profit plan" details about your Forced Draft Dual Fuel Burner.

Name_____
Company_____
Address_____
City_____ Zone____ State_____

Solve toughest large scale ventilation problems



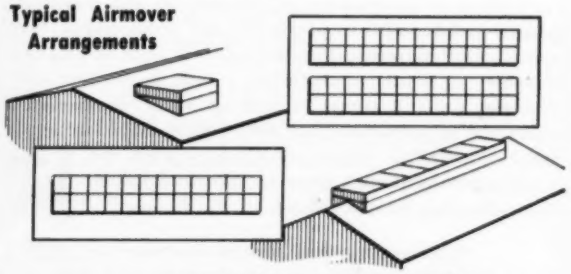
The low-contour Airmover for high-capacity air movement

You can have all the ventilation you want—at economical cost. Airmover exhausts large quantities of heat, smoke or fumes rapidly through its short-air-travel, low-air-friction construction. It's only 32 inches high, built in rectangular units that can be placed on any type roof.

Install any number of units in continuous runs. You literally can "open your roof to the sky", yet have full weather protection. Single units or shorter runs prove effective over specific "hot spots". The low contour and unusual flexibility have made Airmover the popular industrial ventilator. Write for Folder 326F.

The Swartwout Line includes a variety of gravity and powered ventilators.

Typical Airmover Arrangements



18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

pany in 1948 as a physicist in the research department and was assistant to the director of research. Since 1952, he has been director of ordnance engineering.

FRANK X. GILG has been appointed an executive assistant in the Boiler Div. of the *BABCOCK & WILCOX CO.* Since joining the company in 1922, he has served as a draftsman at the Bayonne plant, design engineer in the research and service departments, a staff engineer, and application engineer.

JACK G. KEHOE has been appointed manager of the Dayton sales region of *CHRYSLER AIRTEMP.* He has been with the company since 1941 and has administered sales training and sales promotion programs.

The *PARAGON ELECTRIC CO.* has established a new diaphragm power element division and has appointed *JURG A. SENN* as manager.

ERIC G. PETERSON has been appointed executive vice-president by the board of directors of *PEABODY ENGINEERING CORP.* Mr. Peterson has been with the company since 1928. His new position covers all phases of research and engineering, production and sales.

The *NATIONAL COAL ASSOCIATION* has appointed *GLYNN L. CORYELL* to the engineering staff. Mr. Coryell was previously district sales manager with the U. S. Machine Corp. for the Boston and southeastern Massachusetts areas. He became associated with the NCA after resigning this position. In addition to service in the engineering department, he will assist in the activities in the field of fuel engineering and coal-fired steam plant design.

HARRY C. SLAGLE has been transferred to Pittsburgh as manager of *ALUMINUM CO. OF AMERICA's* shop training program. He was previously manager of the Chicago plant.

THERMOID CO. has announced two new appointments. *A. K. RUNKLE* is superintendent of the Friction Div. succeeding *CARL P. BROCKWAY*, who has been appointed president and director of *ASBESTOS MFG. CO.*, a subsidiary. Mr. Runkle has been with the company for the past 20 years serving in all phases of friction manufacturing. Mr. Brockway is a vice president of the company and formerly was in charge of the Friction Div.

IN THE TERRITORIES . . .

For *COMBUSTION CONTROL CORP.—KENNETH R. BLAINE* is the new office manager in the Atlanta area and *ADOLPH J. ERICKSON* is office manager in the Dallas area.

For *BUILDERS-PROVIDENCE, INC.* and *OMEGA MACHINE CO.*—A new location for their midwestern

greater efficiency for

Commercial and Industrial

GAS

fired heating plants with

field

"M-G" draft controls

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provide simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases—resulting in greatly increased life.

Now there is a Field Draft Control to provide for commercial gas-fired heating plants the same accurate, dependable, fuel-saving performance that has made Field first choice for oil and coal furnaces. The new Field "M-G" for gas is fully proven, widely accepted, fully safe — a control specially designed for gas but retaining all outstanding design features of the Field Type M Control. Write today for complete information.

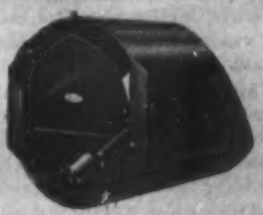
FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division, — Cranes, Hoists

UP-DRAFT VIEW

Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.



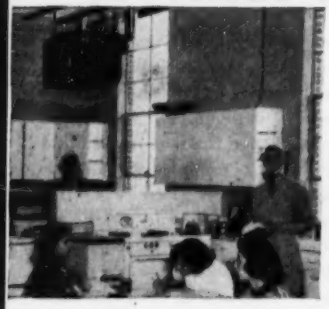
DOWN-DRAFT VIEW

Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.

Heating Installation by Haugas, Inc., Washington, Mo.

"Janitrol gas unit heaters helped us build within our budget"

STATEMENT BY MR. JAMES DAWSON, SUPT. OF SCHOOLS, CRAWFORD COUNTY, BOURBON, MISSOURI



"By using Janitrol Gas Unit Heaters instead of a central heating system, we saved enough to build within our budget. Installed in September, the 17 Janitrol Unit Heaters have proved highly satisfactory!", said Mr. Dawson.

The teachers, too, are very happy with this heating system. Each room being thermostatically controlled, each teacher can maintain any desired temperature.

Why not consider the *practical money-saving advantages* of Janitrol Unit Heaters for your requirements . . . whether for a new plant, a remodelled building or to replace an obsolete heating system that is costly to maintain and operate?

Write today for your copy of Businessman's Blue Book of Better Heating. It gives numerous examples of correct unit heater installation practices for many types of buildings.

★ ★ ★

***Bruce F. Barnes, of the firm of Barnes and Snipes, architects, writes,* "The reasons for considering your equipment included economy of installation and flexibility of handling the heating problem. Savings over other equipment approximate over 50%."**

★ ★ ★

®Janitrol

GAS-FIRED UNIT HEATERS

SURFACE COMBUSTION CORPORATION • TOLEDO, OHIO

sales office and service center. The address now is B-I-F Industries, 2039 W. Howard St., Chicago.

For *WARD LEONARD ELECTRIC CO.*—The establishment of a new district office at 3045 W. Liberty Ave., Pittsburgh 16. *LEONARD H. WURZEL* is in charge.

For the *INSUL-MASTIC CORP. OF AMERICA*—Two companies which have accepted licensee contracts are the *STARR DAVIS CO., INC.*, Greensboro, N. C., and the *PLANT ASBESTOS CO.*, Emeryville, Calif.

For *AIRTEMP DIV., CHRYSLER CORP.—PETER J. DALTON* has been named manager of the Detroit sales region replacing *JEROME A. CLARKE*, who is now in charge of sales training activities at the Dayton plant.

For *ATKOMATIC VALVE CO.*—Three new representatives. *A. H. BARBERA & CO.*, 131 N. Martel Ave., Los Angeles, will cover the Southern California and Clark County, Nevada territory; *IRVING KAHN ASSOCIATES*, 541 Windsor St., Hartford, will cover the state of Connecticut; and *WICKERSHAM, PETTY & CO.*, 683 Atlantic Ave., Boston, will cover eastern Massachusetts, Vermont, New Hampshire, Maine and Rhode Island.

For *WILLIAMS DIV., EUREKA WILLIAMS CORP.—R. T. MARSHALL* has been appointed sales manager, southern divisional, with headquarters in Dallas. His territory includes Southern California, New Mexico, Arizona, Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, South Carolina, Georgia and Florida. *HAROLD HAUG* is field representative for Maryland, Ohio, Pennsylvania and West Virginia with headquarters near Pittsburgh.

For *BUSH MFG. CO.* and *HEAT-X-CHANGER CO.—GEORGE J. FINCK* has been appointed district manager, *EDGAR L. DISBROW* is handling sales engineering for both companies, *HUGO BASCH* is application engineer, *ARTHUR H. RANDALL* is handling the Bush heating line in the metropolitan New York area. *LEON J. TRANEY* and *GEORGE T. DAVIS* now are sales engineers in the Philadelphia district.

For *FEDDERS-QUIGAN CORP.—RICHARD K. ACHBERGER* has been appointed a sales manager in the Cleveland district with headquarters in Lexington, Ky.

For *A. O. SMITH CORP.—FRANK GRAMM* has been appointed eastern regional sales manager of the welding products division, with headquarters in the new Lancaster, Pa. electrode manufacturing plant.

For *CLEAVER-BROOKS CO.*—The *HATHAWAY-McCARTNEY ENGINEERING & SUPPLY CO.* has been appointed exclusive sales agent for self-contained boiler equipment. The territory includes Colorado, southeastern Wyoming, western Nebraska, and western Kansas.

REFRIGERATION AT ITS BEST!

Where Uniform Controlled Temperature Is Required, Specify DOLE *VACUUM COLD PLATES*

The intensely cold DOLE *VACUUM COLD PLATES*, installed in overhead banks, keep frozen foods at proper temperature until time of delivery, thus insuring retention of quality and flavor. In addition, the *natural* circulation created by DOLE *VACUUM COLD PLATES* reduces dehydration and increases operator comfort. DOLE *VACUUM COLD PLATES* are available in various sizes to fit any cold storage room. . .

WRITE FOR CATALOG AE

DOLE REFRIGERATING COMPANY
5918 N. Pulaski Road, Chicago 30, Ill.
103 Park Avenue, New York 17
In Canada: Dole Refrigerating Products, Ltd.
44 Elgin Street, Brantford, Ontario

Maximum Refrigeration Efficiency
DOLE
MANUFACTURERS OF
THE *Cel* LINE

WANT THIS NEW CATALOG?

NEW ASCO CATALOG

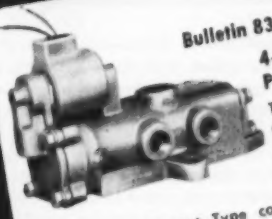
Describes Scores of Solenoid Valves

New Valve Catalog No. 24 brings you up-to-date on the extensive ASCO line of Solenoid Valves (list prices are included). New valves developed and put on the market recently are described in detail *for the first time*. A few of these are:

Bulletins 8262 and 8314
Midget Size
2 & 3-Way Packless Solenoid Valves

Midget Valves are now available with EXPLOSION-PROOF Solenoids for Class 1, Group D hazardous locations.

2-Way (Normally Open or Normally Closed)— Ports, 1/16" through 3/16"; pressures up to 1000 p.s.i. 3-Way — Ports, 3/64" and 3/32"; pressures up to 125 p.s.i. Time Delay Feature — Valves with 3½-6½ seconds delay also available.



Bulletin 8344
4-Way POPPET TYPE Packless Solenoid Valves

This valve has been thoroughly tested as a control unit in equipment requiring "plus" performance. Valve features:

Reliability — Poppet Type construction means this valve will not stick! Power stroke occurs in both directions — no spring return!

Fast Operation — 500 cycles/minute continuous duty; 750 cycles/minute intermittent duty (air).

Freedom in Mounting — Can be mounted in any position. Available 4 and 5 port; flow metering; standard or manifold mounting; ⅜, ½, ¾, and 1 inch pipe size. Handles air, water, or hydraulic oil; maximum pressure 250 p.s.i.

These two are just examples of new valve data. If you have any need for controlling the flow of liquids or gases in the equipment you are designing or operating, you should find this up-to-date ASCO Valve Catalog useful. Want a copy? Just drop us a note or call up and let us know. We'll be glad to send it to you . . . and extras for your associates if you desire.

ASCO Solenoid VALVES

We manufacture a complete line of Electromagnetic Controls including Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and complete Control Panels.

V.53.1

Automatic Switch Co.

389 LAKESIDE AVENUE · ORANGE, NEW JERSEY

Kno-Draft recommends

***Alnor* VELOMETER**

for Precision Air Flow Readings

Ask The W. B. Connor Engineering Corporation how to balance an installation equipped with their Kno-Draft diffusers, and they'll tell you . . . measure the *actual* air delivery—precisely and quickly—with an Alnor Velometer.

Balancing a Kno-Draft equipped installation is a fast and accurate process when using an Alnor Velometer. A few simple readings of the instrument and a twist of the wrist are all that is required to adjust the air flow to the desired amount.

The Velometer is the *only* instantaneous, direct-reading air velocity meter—accurate in all ranges, from high to low—compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

For your air measurement needs, get an Alnor Velometer. You'll save time and money wasted in balancing air distribution on your next installation. If you'd like a copy of the instructions on balancing Kno-Draft diffusers with the Alnor Velometer, just send the coupon below.

Illinois Testing Laboratories
Room 513, 420 N. LaSalle St.
Chicago 10, Ill.

☐ Send Kno-Draft Balancing Instructions
☐ Send Velometer Bulletin 2448-G

Name.....

Company.....

Address.....

City.....Zone.....State.....

Alnor PRECISION INSTRUMENTS FOR EVERY INDUSTRY

For *GUSTIN-BACON MFG. CO.—KELLEY ASBESTOS PRODUCTS CO.* is now distributor in Kansas City for glass fibrous products.

For *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—A mid-Atlantic regional office has been opened on W. Hunting Park Ave., Philadelphia. Also *E. M. TOUSSAINT* has been appointed general manager of the Appliance Controls Div., with headquarters in Los Angeles.

For *INTERNATIONAL HEATER CO.—CLOYD C. WEAVER* has been appointed sales engineer in the eastern Ohio territory and *ADRIAN R. MAVIS* is the new sales representative in Kentucky and southern Ohio.

For *REYNOLDS METALS CO.—MEIER BRASS & COPPER CO.* has been appointed distributor in the Detroit area for Reynolds aluminum.

For the *TRANE CO.—BEN A. SCHWIRTZ* has been appointed manager of the Cleveland sales office. It has also been announced that the Chattanooga, Tenn. sales office has been moved to 308 S. Kelley St.

For *DRYOMATIC CORP.*—Appointment of new sales and service representatives in the middle west has been announced: Chicago metropolitan district, *J. A. CURRIE*, 7001 N. Clark St., Chicago 26; the remainder of Illinois, *N. L. PEARSON*, 121 Downer Pl., Aurora, Ill.; entire state of Wisconsin, *R. C. SCHNEIDER*, R. C. Schneider Co. Inc., 6521 W. State St., Milwaukee 1; and Minnesota, Iowa, and North and South Dakota, *O. R. KREUTZIGER* and *WARREN KJELDSEN* of K & K Sales Co., 1953 University Ave., St. Paul 4.

For *DRAYER-HANSON, INC.—MEL A. DISNEY* has been appointed manufacturer's representative for refrigeration and air conditioning equipment in the eastern part of Kansas and the western part of Missouri; *MARK RAYMON* now is manufacturer's representative for air conditioning equipment covering the entire state of Oregon; *HARRY TORCH* is manufacturer's representative for the Atlanta territory; and *BROCK MOTT* is Gulf Coast distributor for industrial products.

For Electro Dynamic Motor & Generator Div., *GENERAL DYNAMICS CORP.—JAMES J. BECHER* has been named a sales engineer in the Chicago district office.

For *WHEELCO INSTRUMENTS DIV., BARBER-COLMAN CO.*—The following appointments have been announced: Chicago, *ROBERT UNGER*, service engineer; Detroit, *HAROLD L. DIRKERS*, sales engineer and *LEONARD V. BLOOM*, service engineer; New York, *WILLIAM E. KING*, service engineer; Boston, *LAWRENCE S. HOLBROOK*, service engineer and *ROBERT HEMMAN*, sales engineer; Rockford, *SCOTT R. BABCOCK*, service engineer and *CYLDE PERSON*, service engineer.

MERCOID SENSATHERM

The low voltage thermostat that operates directly from the TRUE ROOM TEMPERATURE—no internal heaters, —no cycle adjustments—no special settings—simply install it—set it—and forget it • Equipped exclusively with the Mercoid magnet operated mercury switch—the switch that can give a million operations without deterioration • The cover has a lifetime finish.

AVAILABLE FOR

HEATING

REFRIGERATION

AIR CONDITIONING

TROUBLE-FREE PERFORMANCE

Write for catalog No. 700A.

THE MERCOID CORPORATION

4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.

For HARD-TO-HEAT Buildings

THERMOBLOC

SELF-CONTAINED DIRECT-FIRED HEATERS

save up to 1/3 on heating costs

Uniform temperatures at working levels . . . high heating efficiency (82-86%) . . . no costly pipes, ducts or radiators . . . automatic temperature controls—these are only a few of the many advantages you get with THERMOBLOC Heaters.

HEAT COMFORT FOR ALL BUILDINGS

Thermobloc Heaters provide continuous 360° gentle circulation of live, warm air at working level—no drafts, no heat loss in roof trusses in such hard-to-heat buildings as railroad roundhouses, foundries, factories, warehouses, truck terminals, or wherever there is a large open area.

LOW COST HEATING

Completely installed Thermobloc costs about ⅓ of conventional systems. Fuel savings result from more efficient heat distribution. No heat losses due to radiation.

SPACE SAVING

Occupies smallest floor area per btu of any direct-fired heater.

ALL SIZES FOR ALL PLANTS

For complete details, mail the coupon today.

THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

Manufacturers of P-D Power Plant Equipment

5-8 Meadow Street Norwalk, Conn.

THERMOBLOC DIVISION
Prat-Daniel Corporation
5-8 Meadow Street, Norwalk, Conn.

Gentlemen:
Please send me complete details on Thermobloc Heaters

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

For *QUIET HEET MFG. CORP.*—Five new distributors for Quiet Kool air conditioners have been announced: *SPIEGELS INC.*, 1061 W. 35th St., Chicago; *W. W. GRAINGER, INC.*, 2330 W. Adams St., Chicago; *AIR-TEX CORP.*, 333 N. Michigan Blvd., Chicago; *CUTLERS EXCHANGE*, 901 Demonbreun St., Nashville; and the *SUTTON ELECTRIC SUPPLY CO.*, 900 E. First St., Wichita, Kan.

For *MILLER ELECTRIC MFG. CO.—WILLIAM J. SPILLMAN* has been appointed field sales representative for western California and Arizona with headquarters in Long Beach, Calif.

For *A. M. BYERS CO.—J. J. MERRILL* has been appointed Boston division manager. He has been a field service engineer in Chicago for the past 11 years.

For *GENERAL ELECTRIC CO.—GRANT A. MORRISON* is representing the Carboloy Department, Detroit, in the midwestern district.

For *MITCHELL MFG. CO.—BRUCE E. CROCKETT* has joined the sales management department of the Wisconsin district. Headquarters are in Milwaukee.

For *GRAVER WATER CONDITIONING CO.—A. H. HONECK* has been appointed district manager in Cleveland and Cincinnati. His territory includes the state of Ohio and the northern counties of the state of Kentucky.

For *KAISER ALUMINUM & CHEMICAL SALES, INC.*, Chemical Div.—Two new sales managers. *RUSSEL T. DRENNAN* is eastern sales manager and *JOSEPH A. VOSS, JR.* is assistant eastern sales manager. Both men will maintain headquarters at the sales office at Akron, Ohio.

For *GENERAL ELECTRIC CO.*—New sales branches for the heat pump department. The two new offices are located in Los Angeles and Chattanooga, Tenn.

STANDARD INSTRUMENT CORP., with offices at 350 Fifth Ave., New York, has been organized to take over the business of General Power Plant Corp. and to handle Robot-Eye and Ace Instrument Corp. combustion controls. *WARNER F. DeFOE*, formerly president of General Power Corp., is president of the new company. *W. HARVEY THOMPSON*, formerly of Diebold Inc., is vice president in charge of sales. Both are directors.

For *WESTINGHOUSE ELECTRIC CORP.*—The establishment of the Mid-America Region with headquarters in Chicago, covering Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin, parts of Illinois, Indiana, and Michigan. *A. M. FISHER* is manager of the Chicago district office. *V. S. ACTON* replaces him as regional

It's the **LOW DOWN** DIRT trapped by
WILSON'S HAIR FILTERS
that GUARANTEES LONGER LIFE

In Wilson *Hair* Filters the entire dust-holding capacity is completely utilized. This means, *no surface dust stopping only*, but Full-Depth Dust Trapping at its best . . . and many extra months of filter life.

The *reasons* are so simple:

1. The hair media in Wilson *Hair* Filters act in the same manner as Mother Nature's proven way of filtering the air you breathe. It's the *hair* that cleans the air . . . more easily, more effectively, more economically.
2. The multi-directional distribution of the hair in Wilson *Hair* Filters literally invites all dust and dirt to come in and be trapped throughout the entire filter interior.
3. Most brands of air filters require oiling on their inlet surfaces. This stops dust prematurely, loads up the incoming air side and materially shortens filter life.

Wilson Hair Filters are not oiled on the inlet side. Instead, they receive an even distribution of mineral oil *on their outlet surface*, which:

(a) augments the already amazing ability of the hair itself, to catch and hold dust, and—

(b) builds an impregnable barrier which halts dust and dirt after reaching the furthermost practicable penetration point.

WILSON & CO., INC.
(Air Filter Division) 4100 South Ashland Ave., Chicago 9, Ill.

Wilson Hair Filters are another quality product of Wilson & Co., world-famous for meat products, sports equipment, pharmaceuticals, hair products, etc.

The famous Edgeseal, the original *Hair* Filter with the patented self-sealing edge.

The popular Honeycomb, the dressed up *Hair* Filter that is so easy to handle.

Save delay. Save dollars. Save doubt. Send for FREE sample with details and prices.

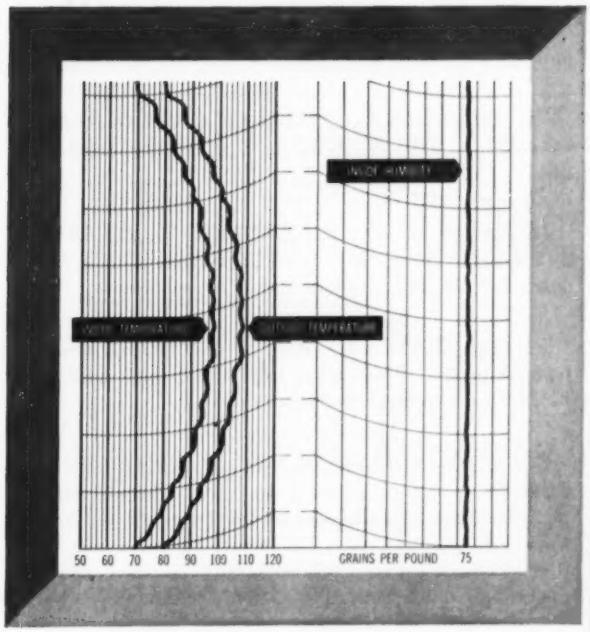
WILSON'S HAIR FILTER

portrait of

less than 1% absenteeism

At Auto Specialties' windowless Hartford, Michigan plant, a Kathabar dehumidifier keeps the summer humidity at a constant 75 gr/lb for comfort. Inside temperature is maintained at 72° F—or 10° F lower than outside temperature—whichever is higher.

The results: (1) *less* than *1%* absenteeism; (2) optimum production conditions throughout the summer—even on the hottest, muggiest days; (3) reduction of product dimensional changes due to temperature fluctuations.



This is a typical example of how Kathabar's 20 years' experience in humidity conditioning serves industry. Whether you are interested in comfort applications or in controlling air moisture in industrial processes, put Kathabar experience to work for you.

Write today describing your problem or asking for Kathabar Literature Group K-53-7.

Kathabar
HUMIDITY CONDITIONING

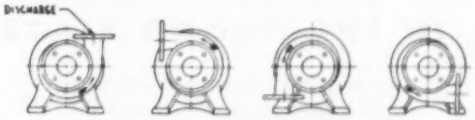
SURFACE COMBUSTION CORP., TOLEDO 1, OHIO
ALSO MAKERS OF
Surface INDUSTRIAL FURNACES *Janitrol* AUTOMATIC SPACE HEATING

WEINMAN
Close
Coupled
Centrifugal
Pumps

lower in first cost, lower in maintenance cost!

Installation of air conditioning systems is sometimes a tricky business. Space in existing buildings is usually limited, making pump replacement a real problem. WEINMAN close coupled centrifugal pumps are designed to lick this problem, and here's the way they do it:

WEINMAN pumps require less space to begin with. They can be mounted in any position. Note, too, that the discharge can be turned to any one of four different positions.

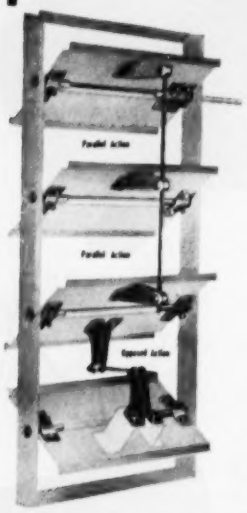


This means you can mount a WEINMAN pump on the wall, suspend it from the ceiling, bottom or side of a tank, or on the floor . . . important where installation space is limited.

If pumps are a problem that's plaguing your installations, call a WEINMAN Centrifugal Pump Specialist. He has the solution and the pumps, to solve the toughest jobs.

"Centrifugal Specialists"
The WEINMAN Pump Mfg. Co.
296 Spruce St. Columbus 8, Ohio

Engineers • Manufacturers & Fabricators



FOR MULTI-BLADE DAMPERS
(Parallel or Opposed Action)
Specify and use the . . .

"DURO BLADE KIT"

PRECISION-ENGINEERED DAMPER HARDWARE

- **Produces highest quality damper.**
- **Blade openings individually adjustable. Automatic, self-centering DURO-BRACKET assures smooth, non-binding, quiet operation. Self-oiling DURO-BUSHINGS "tap-fit" into frame.**
- **Complete adjustability, even after installation, cuts time and cost. Allows use of unskilled labor.**
- **Sturdy, corrosion resistant materials used throughout. Can be used on heaviest dampers.**

For Samples — Prices write Dept. D

DURO-DYNE
CORPORATION
38 South Franklin Street, Hempstead, L. I., N. Y.

air is expensive

IN THE WRONG PLACE

Air mixed with the steam in your heaters or coils is expensive because it retards heat transfer and lowers steam temperature. Remove air from steam heated machines with ***Sarco thermostatic air vents.*** Write for Bulletin 276 and the name of the Sarco man nearest you. He can help you select the best vent for your purpose and the right place to install it.

Represented in Principal Cities **502**

SARCO SAVES STEAM — SARCO COMPANY, INC. Empire State Bldg., New York 1, N.Y. SARCO CANADA LTD., TORONTO 8, ONTARIO

industrial department manager, and *J. R. WALTER* is regional manager of the Application Data and Training Dept., replacing *C. W. MILLS* who has accepted a new position in the Chicago district office.

For *BARBER-COLMAN CO.*—The *AUTOMATIC CONTROL* and *UNI-FLO DIVISIONS* have opened new factory branch offices at 218 Harrison St., Syracuse, with *K. C. WATSON* as manager, and at 1143 Mary St., Jacksonville, with *D. W. MINICK* as manager.

For *CARRIER CORP.*—New quarters and expanded facilities for the Cincinnati office are located at 2904 Woodburn Ave.

For *BURGESS-MANNING CO.*—The *HAMPSHIRE CORP.*, 330 W. 24th St., Baltimore, has been appointed sales representative for the newly developed multi-purpose ceiling in Maryland, Virginia, District of Columbia and parts of Delaware, West Virginia and Pennsylvania.

For *AMERICAN GILSONITE CO.—ROY O. NELSON CO.*, 330 S. Wells St., Chicago 6, is the new representative.

For *NU-WAY CORP.—EDWARD J. ALLARD* of Swampscott, Mass. has been appointed manufacturer's agent for all New England states.

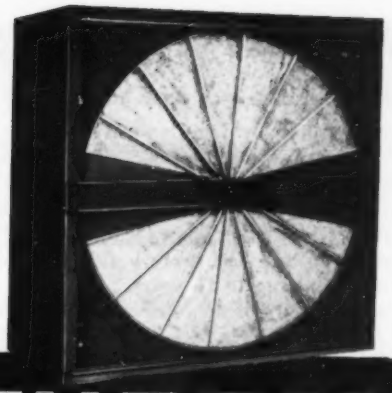
For The *TRANE CO.—ROY L. SMITH* has been appointed to the Philadelphia sales office, and *JAMES J. CALLAHAN* to the Newark sales office.

For *ACME INDUSTRIES, INC.—WILLIAM HOWARD PETERS* is eastern regional manager. He will manage the New York office located at 2808 Lincoln Bldg., New York. In addition, Mr. Peters will supervise the activities of the company's representatives in New England, upper New York State, Philadelphia, Washington, D. C., Virginia and the Carolinas. For the past three years, Mr. Peters was eastern regional manager for the Remington Corp.

For *SELAS CORP.—RICHARD S. VAN NOTE* has been appointed district sales manager of the Chicago office.

For the *NATIONAL RADIATOR CO.*—A new factory branch sales office at 960 W. St. Clair Ave., Cleveland. *ROBERT G. HARRISON* has been appointed manager of the Cleveland branch. With him will be *VICTOR L. EDWARDS*, of Johnstown, Pa., and *RICHARD J. McCHESNEY*, of Pittsburgh. The new branch covers 31 counties in Ohio formerly under the jurisdiction of the Pittsburgh office.

For the *MARLEY CO.*—A new location of its Houston sales office at Suite 1601, Commerce Building. *ROY W. MAZE* is Gulf Coast manager.



HOLD DOWN HEATING OR COOLING COSTS!

THERM·O·WHEEL

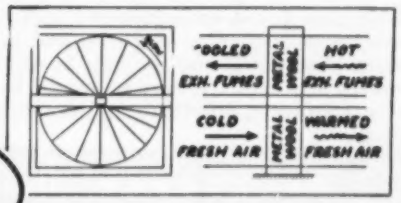
holds heat or cold while exchanging air!

Now, with THERM-O-WHEEL, smaller heating or cooling units can serve a greater area . . . your present systems can be run more economically, with constant ventilation.

HERE'S HOW:

Therm-O-Wheel retains up to 96% of heat or cold by utilizing the "counterflow" principle. The rotating metallic wool in counterflowing air streams permits almost complete transfer of temperatures between exhaust and fresh makeup air. Therm-O-Wheel operates efficiently in any degree of temperature-difference between the two air streams. Ideal for theatres, assembly halls, industrial, chemical and brewing operations, etc.; winter or summer ventilating.

Write for complete details.
Some territories for distributors still open



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INCORPORATED

THERM-O-WHEEL, INC.
1042 Twenty-second St., Far Rockaway, N.Y.

**and naturally they're using*

STANDARD'S NEW

Perimeter Floor Register

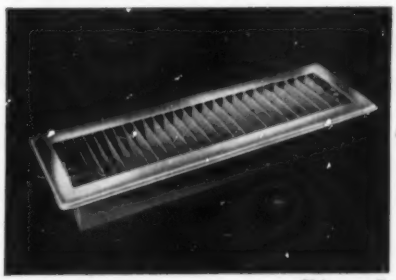
with Standard's exclusive
DIALAMATIC CONTROL

**This is it!*

Model No. PH-142

Works Better

Made Stronger



SPECIFICATIONS

The face and blades of model PH-142 are fabricated of 16 gauge steel, the blades are set in a fixed-fan angle degree for even deflection. The frame is of one piece, 18 gauge steel construction. The Louvre box fabricated of 16 gauge steel. Packed one to a box, and 20 to a master carton. Comes handsomely finished in gleaming, durable metallic-lustre. 4 sizes available.

For more information and Standard's New Pocket Catalog, attach this coupon to your business letterhead and mail to:

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3151 WEST 49TH PLACE • CHICAGO 32, ILL.

for Appearance, *for* Lower Maintenance,
for Emergency Reliability
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FIRE EXTINGUISHER CABINETS

Recessed or Outside Wall Types — 36 Models — 4 Sizes

Cabinet-enclosed extinguishers look better, wear better, discourage tampering and personal injury. And you'll find the best in ALLENCO —voted *first* in interior fire protection by architects, engineers, distributors and contractors.

See SWEET'S . . . write for nearest consulting office and A. I. A. file 29e2

Established 1887
W. D. ALLEN *Manufacturing Co.*
CHICAGO 6 • NEW YORK 7

Monarch
NOZZLES
for

HUMIDI-FYING

Monarch Brass F-80 Air Conditioning Nozzles (or ¼" male one-piece H-261 style) produce the finest possible breakup of small capacities with low direct pressure only. No air required.

The most popular size is #3.00 which operates on as little as 25 pounds pressure, delivers 1.00 gph and produces a very wide angle of spray (120°) in a fine, soft, fog-like mist.

Available in 25 different capacity sizes from .57 gph upwards, all Brass construction with 120 mesh Monel screen strainers.

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CANADIAN SALES AGENT (EXCEPT B.C.) CANADIAN GENERAL FILTERS LTD., 2679 DANFORTH AVE., TORONTO 13.

NEW BOOKS & REPORTS . . .

Low-Alloy Steel Corrosion in Soil

A recent study by the National Bureau of Standards provides new information on the corrosion of certain low-alloy irons and steels in soils. Specimen plates of several of these materials (containing up to about 6 percent of total alloying elements) together with reference specimens of plain steel, were buried at 15 different test sites for periods up to 13 years.

Included in the Bureau's study, titled *Corrosion of Low-Alloy Irons and Steels in Soils*, which was conducted by I. A. Denison and M. Romanoff of the NBS corrosion laboratory, were specimens of copper-molybdenum open-hearth irons, nickel-copper steels, and chromium steels with and without molybdenum. Sets of specimens were removed at regular intervals over the 13-year period and after removal of corrosion products the weight losses and depths of the deepest pits were measured.

According to the report, the steels containing 4 to 6 percent of chromium generally lost only about half as much weight as did plain steel under the same conditions. However, the greater corrosion resistance of the alloy steels as measured by weight loss is not generally accompanied by a corresponding reduction in the maximum depth of pits. The least pitting was observed on specimens that contained molybdenum in addition to chromium.

The study has been reprinted as NBS Research Paper 2367 and is available for 10 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Plant Maintenance Proceedings

Techniques of Plant Maintenance—1953 contains the text of 61 sessions of the Plant Maintenance & Engineering Show held in Cleveland last January. Highlight is the publication of 859 questions and answers at the general and sectional conferences. Thousands of other questions and discussions, submitted at the 21 roundtables, are summarized in narrative style. Also included are texts of 20 papers and 41 charts.

One of the roundtables covered deals with pumps and piping. Of special interest in the general sessions reviews are those on maintenance operating policies, preventive maintenance and corrosion prevention and control.

The book, which contains 288 pages, is sent without charge to those who attended the conference. It is also available for $6.00 from the publishers, Clapp & Poliak, Inc., 341 Madison Ave., New York 17. Those wishing to establish complete libraries may obtain the earlier volumes for the years 1950, 1951 and 1952.

Measuring Flow of Fluids in Closed Ducts

Various methods have been devised to measure the flow of fluids in closed ducts but many standard methods are inaccurate, time-consuming, or both. In a recent University of Illinois bulletin, *A Multitube Differential Pressure Manometer for Measuring the Average Fow of Fluids in Closed Ducts*, a manometer developed by the University's mine ventilation laboratory is described. The author, George B. Clark, associate professor of mining engineering, limits his discussion to measuring the quantity of air flowing through mine openings or the flow of air in standardized fan tests.

TYPE F43A

A DUAL SWITCH THERMOSTAT
FOR USE FROM -150° F to +600° F

Manufacturers with thermal control problems similar to those encountered in water baths, industrial ovens, hot plate presses, coffee roasters and heating equipment should investigate the Type F43A dual switch thermostat. It is a precision-built temperature control available with a wide variety of thermal assemblies and switches for use between -150° F and +600° F. It can control two separate circuits simultaneously as required, for instance, in an air conditioning system where a fan control and compressor control are required.

Write for bulletin #3-4 which gives full specifications.

UNITED ELECTRIC CONTROLS COMPANY
87 School Street, Watertown, Mass.

STANDARD & SPECIAL THERMOSTATS
& PRESSURE SWITCHES

BACK PRESSURE VALVES . . .

No. 135 illustrated — Klipfel Cup Disc back pressure and relief valve cuts size required to half that of other types. Very large capacity with closer, chatter-free regulation. Closes tight with minimum blow down. For maximum inlet pressures 80 to 300 lbs. according to size. Other types available. GET BULLETIN 648.

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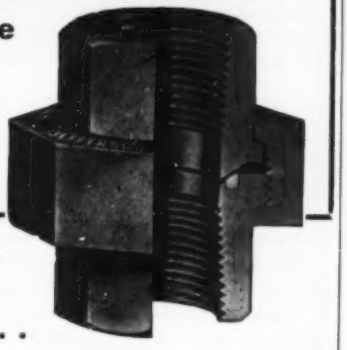
Klipfel VALVES, INC.
HAMILTON, OHIO

JEFFERSON UNIONS

featuring the *exclusive* RECESSED BRASS SEAT



. . . meet ALL your piping needs . . . . . .

With its completeness in sizes and types, including convenience unions as well as flange unions, the JEFFERSON line will fully satisfy *all* your needs.
And remember: "JEFFERSONS" are of air-refined, air-tested malleable iron of high tensile strength. Furthermore they offer the exclusively Jefferson Recessed Brass Seat and a ball joint of truly spherical contour.
Remember, too, that all Jefferson "300 LB" unions are so marked for your quick identification and fullest protection. The Jefferson line offers OWG 2000# to 2" and 1000# up to 4". Included are AAR male and female unions, Enduro 300#, Excel 250# and Master 150# unions. All types also available with all-iron seats. Underwriters approved.
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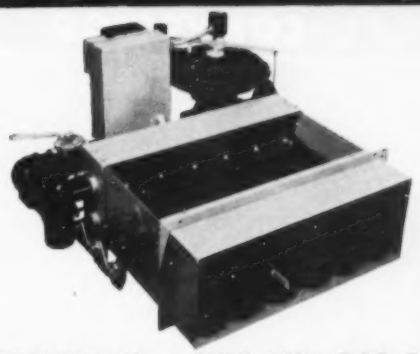
35 Fletcher Avenue, Lexington 73, Mass.
65 Gooding Street, Lockport, N. Y.

for Gas Firing



The HORIZONTAL or TYPE "H" GAS BURNER for Scotch Marine or other type boiler where the "Inshot" type of firing is preferred. Multiple flame retention heads assembled in a heavy gauge housing with balanced air louvres and specifically designed pilots provide the maximum in flexibility and dependability. Complete prewiring and factory assembly of controls simplifies, and cuts hours from installation time.

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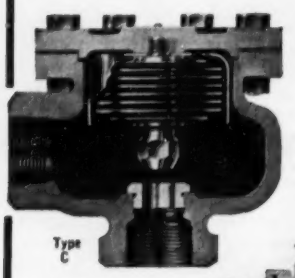
P. O. BOX 332
WINFIELD, KANSAS

Nicholson Steam Traps

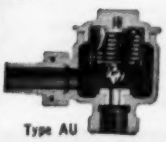
CUT HEAT-UP TIME 48%

A large processor recently reduced the heating cycles of cookers from 1¾ hrs. to 50-60 min., by substituting Nicholson thermostatic steam traps for a mechanical type. This effected a gratifying production increase of 37%. Reasons for Nicholson's faster heat transfer: operate on lowest temperature differential; 2 to 6 times average drainage capacity; maximum air venting.

5 TYPES FOR EVERY APPLICATION, process, heat, power. Sizes, ¼" to 2"; press. to 250 lbs.



Type C



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BULLETIN 853 or see Sweet's

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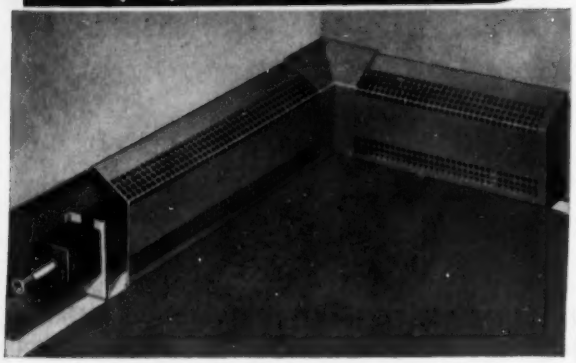
New Design "Floor-Level" BASEBOARD CONVECTOR



- **Solves Wall-to-Wall Carpeting Problems**
  Rugs laid up to — not under — cover
- **Directs Warm Air Away From Wall**
  Keeps walls clean
- **Simple Installation**
  New snap-on element hangers solve field alignment problems.

Write today for literature and prices.

REMPE COMPANY

342 N. Sacramento Blvd., Chicago 12, Illinois.

The manometer, using 20 fixed pitot tubes, measures the velocity pressures simultaneously at 20 points at a given cross-section of the duct, extracts the square root of each velocity pressure, averages the 20 square roots, and multiplies the result by a constant which is adjusted for the specific weight of air in the duct during the test.

Included in the new bulletin are a description of the theory and construction of this average-velocity gage and an analysis of possible sources of error in readings which are made with it.

The bulletin is published by the University of Illinois Engineering Experiment Station, Urbana, Ill.

OTHER BOOKS AND REPORTS

ASTM STANDARDS ON COPPER AND COPPER ALLOYS—a compilation of all of the ASTM Standards pertaining to copper and copper alloys developed by the various technical committees. The 1953 edition contains 115 standards, 102 specifications and several test methods and recommended practices. An index for reference is included.

Copies of this 556-page book can be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $5.00 each, heavy paper cover, and $5.65 with a cloth cover.

PROCEEDINGS OF THE INSTRUMENT SOCIETY OF AMERICA—1952—a comprehensive coverage of instrumentation in 1952. Included are 77 technical papers, 21 abstracts, a complete record of the 1952 Instrument Conference and more than 350 pages devoted to measurement and control.

Published by the Instrument Society of America, 1319 Allegheny Ave., Pittsburgh 33, the book is available to ISA members for $5.00 and to non-members for $10.00.

PRINCIPLES OF AUTOMATIC CONTROL—32-page booklet containing the text of the sound film by the same name. Written by G. F. Akins, the film describes justification of automatic control, design of an automatic controller and application of a controller to a process.

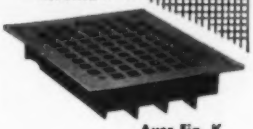
The illustrated booklet, published by the Instrument Society of America, 1319 Allegheny Ave., Pittsburgh 33, is priced at $1.25 a copy. Orders for five to ten copies are $1.00 each.

THE THERMODYNAMICS OF COMBUSTION GASES: Temperatures of Methane-Air, Propane-Air, and Ethylene-Air Flames, Report of Investigations 4983—fourth of a series of reports on the thermodynamic properties of combustion gases prepared by the Bureau of Mines, Department of the Interior, to facilitate the theoretical study of flame and combustion phenomena. The report consists essentially of six tables giving the thermodynamic properties of the combustion products of methane-air, propane-air and ethylene-air mixtures over a range of pressures. It also explains the methods of calculation used in preparing the tables.

Free copies can be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13.

LEADING CONTRACTORS prefer Auer "K" ALL STEEL REGISTERS for walls or ceilings

HERE'S WHY:

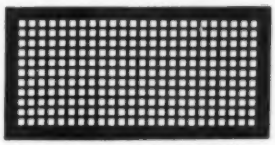


Auer Fig. K Steel Register

1. *Greater Strength*—All Steel construction—heavy gauge steel face. Built to take punishment!
2. *Neater Appearance*—Inconspicuous flush-wall installation. Plain lattice pattern. Stainless steel, bronze, aluminum, chromium or prime finish faces for painting to match any decorative scheme.

Auer Fig. KP Pulley-Operated Register

3. *Easier Maintenance*—Flat surface cleans as easily as surrounding wall. Trouble-free working mechanism.
4. *Other Features*—Patented spring-lock louvre adjustment—easy to operate, non-slipping, positive. Keylock, pole or pulley operated. Available with multiple units behind a single, continuous face. Auer perforated grilles with matching lattice pattern available in any size.



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Perforated
STRAP
Versatile Hanger Iron

Safely supports hanging pipes, conduits and cables up to 500 lbs. Made of ¾-in. 18 gauge electro-galvanized steel (also available in Everdur, copper, brass or aluminum). Precision made—perforations do not vary. ¼-in. holes on ½-in. centers. Comes in 10-ft. coils and 5 and 10-ft. straight lengths. Available in other lengths also.

Send for literature and prices

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VIBRATION PROBLEM? 1100

Solve it quickly and easily—install **Packless Seamless Bronze Vibration Absorbers**—standard sizes to fit copper tubing from ¼" O.D. to 10⅛" O.D. Also readily available in longer or shorter lengths made to your specifications—with threaded, flanged or special fittings.

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PERFORMANCE MEANS PROFITS!

Certified Capacity Ratings of WESTERN ROTARY VENTILATORS sell your customers. See Sweet's Catalog.

Remember — you can't look at a ventilator and judge its value. Western Rotary Ventilators have been thoroughly tested and results published. Check Sweet's, A.E.C. or write for catalog. Features lifetime guaranteed bearings — enduring metallic finish on durable galvanized steel. Throat sizes 6" thru 48". Order from your local dealer. The complete line of Western ventilating equipment is handled by wholesalers coast to coast.

"always on the job—never on the payroll"

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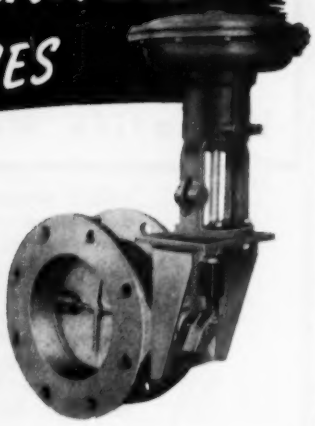
W.S. ROCKWELL VALVES



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AIR CONDITIONING
HEATING SYSTEMS
DUST COLLECTING
VENTILATING SYSTEMS
WATER PIPING
DRAINING & FILLING

For uniform, quick control and shut-off, manually or automatically—

For minimum pressure drop when valve is fully open—

You're sure, you're safe with Rockwell butterfly or slide valves —always dependable.

Temperature—up to 2000°F. Pressure to 300 p.s.i. Construction—any metal or rubber lined. Pipe sizes to 120".

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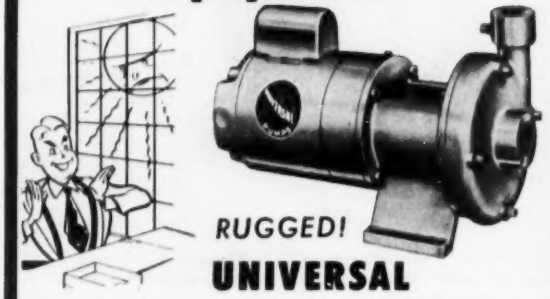
2543 Eliot Street • Fairfield, Conn.

Butterfly Valves • Slide Valves • "Blast Gates"

Especially Designed for Air Conditioning Equipment



RUGGED!

UNIVERSAL

Centrifugal **Pumps**

HPA-8

- Series WXH Low Priced
- Highest quality construction
- Motor—standard make, 3450 RPM
- Shaft Seal—mechanical cartridge type or stuffing box
- Shaft—Precision ground . . . smooth, quiet operation
- Impeller—all bronze, fully enclosed
- Suction—single stage end suction units

Available from ⅙ HP through 5 HP . . . designed for efficient, dependable operation . . . ideal for air conditioning, with large capacities at moderate heads. Write for descriptive circular

UNIVERSAL PUMPS

UNIVERSAL Mfg. Co.

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MEETINGS & CONVENTIONS...

SCIENTIFIC CONFERENCE ON SOLAR ENERGY — University of Wisconsin, Madison, September 12-14. The conference, supported jointly by the University and the National Science Foundation, will assess present knowledge of solar energy utilization and point out needed areas for research.

AMERICAN INSTITUTE OF WHOLESALE PLUMBING & HEATING SUPPLY ASSOCIATIONS — Second annual convention, September 20-23, Waldorf-Astoria, New York. Convention chairman is M. W. Dennison of Braman, Dow and Co., Boston.

INSTRUMENT SOCIETY OF AMERICA, 921 Ridge Ave., Pittsburgh 12 — Eighth National Instrument Exhibit, September 21-25, Sherman Hotel, Chicago. Cooperating groups presenting technical sessions are: American Institute of Electrical Engineers, Instruments and Measuring Committee; the American Institute of Physics; the American Society of Mechanical Engineers, Industrial Instruments and Regulators Div.; the Institute of Radio Engineers, Professional Group on Instrumentation; and the Scientific Apparatus Makers' Association.

INTERNATIONAL CHURCHMANS EXPOSITION, 19 S. LaSalle St., Chicago 3 — Second annual exposition, October 6-9, Chicago Coliseum. Hall of Church Designs and International Church Buildings Forum will be featured.

SOUTH CENTRAL REGION, NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 1061 M & M Bldg., Houston 2 — October 7-9, Mayo Hotel, Tulsa. This region consists of the states of Colorado, Kansas, Oklahoma, Arkansas, Louisiana, Texas and New Mexico.

NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS—Ninth annual meeting, October 8-9, Sheraton Hotel, Chicago. Sponsored by the Illinois Institute of Technology, Chicago 16, the conference director is Otmar E. Teichmann.

The general session will be led off by W. P. Green, Armour Research Foundation, who will present a paper on "Friction and Wear Phenomena." During the presses session there will be a paper by A. J. DeMatteo, Watson-Stillman Co., "Self Contained Pump Units as Applied to Extrusion Presses."

"Boiler Feed Pumps," by O. M. Kristy, Allis-Chalmers Co., and "Ball Piston Pumps and Motors," by H. Stern and W. T. Rauch, General Electric Co., will comprise the pumps session.

"Industrial Application of Non-Flammable Hydraulic Fluids," by D. Milne, General Motors Corp., and "The Effect of Synthetic Fluids on Hydraulic Components and Circuits," by James Robinson, Vickers, Inc. will be the two papers read during the non-flammable fluids session.

The instrumentation session will consist of papers on, "Pressure Transducers," by R. E. Boyar, Askania Regulator Co., and "A Flowmeter for Measuring Mass Flow-Rate with High Speed of Response," by Dr. Yao Tzu Li of the Massachusetts Institute of Technology.

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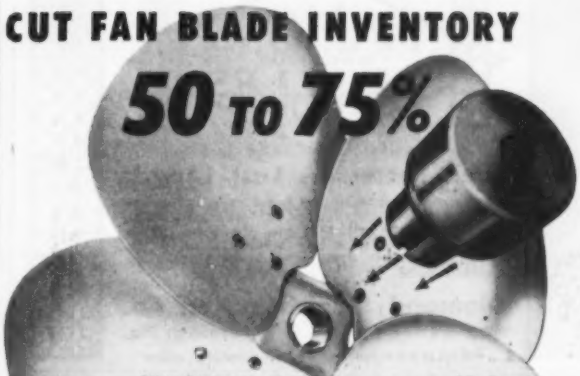

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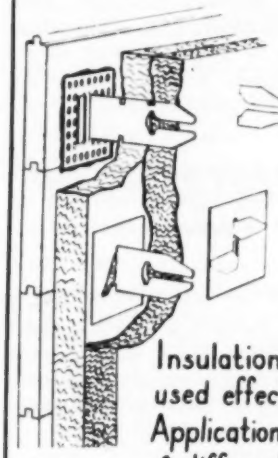

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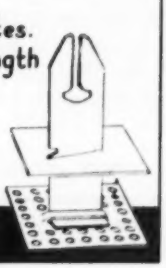

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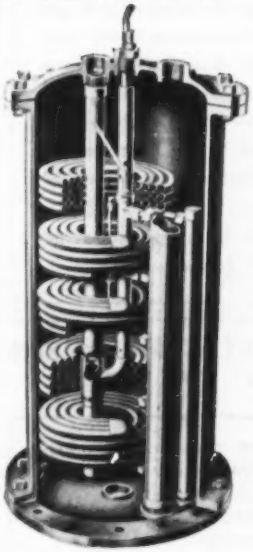

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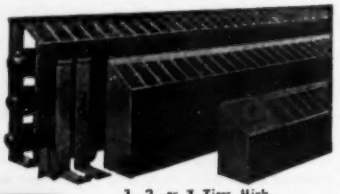

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FIFTH INTERNATIONAL MECHANICAL ENGINEERING CONGRESS, 10 Avenue Hoche, Paris, France —To be held in Turin, Italy, October 9-15. This meeting is the fifth of a series organized by the engineering trade associations of Western Europe. Theme of this year's Congress is, "Production and Assembly Methods for Components in Mechanical Engineering."

NATIONAL ASSOCIATION OF VERTICAL TURBINE PUMP MANUFACTURERS, 301 W. Avenue 26, Los Angeles 31 — Fall meeting, October 11-12, Broadmoor Hotel, Colorado Springs, Colo.

41st NATIONAL SAFETY CONGRESS AND EXPOSITION—October 19-23, Chicago. Sessions on industrial safety are scheduled for the Hilton, Congress, Morrison and Hamilton hotels. Further information is available from R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11.

AMERICAN GAS ASSOCIATION, 420 Lexington Ave., New York 17—35th annual convention, October 26-28. Kiel Auditorium, St. Louis. Hotel reservations are available from the Hotels Convention Bureau, American Gas Assoc., Rm. 405, 911 Locust St., St. Louis 1.

REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOCIATION, 228 N. LaSalle St., Chicago 1 — Convention, November 8-11, Carter Hotel, Cleveland.

EIGHTH ALL-INDUSTRY REFRIGERATION AND AIR CONDITIONING EXPOSITION, 1346 Connecticut Ave., N.W., Washington 6, D.C. — November 9-12, Cleveland Public Auditorium, Cleveland. Emphasis will be on marketing opportunities for retail establishments.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13 — Annual Meeting, January 1954, Houston, Texas.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 1061 M & M Bldg., Houston 2—Tenth Annual Conference and Exhibition, March 15-19, 1954, Kansas City, Mo. Co-chairmen are F. L. Whitney, Jr., Monsanto Chemical Co., St. Louis and H. L. Bilhartz, the Atlantic Refining Co., Dallas.

HEATING, PIPING AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOC., 1250 Avenue of the Americas, New York 20 — 65th Annual Convention, May 24-28, 1954, Hotel Traymore, Atlantic City, N.J. Acting secretary is Lloyd B. Gruman, Jr.

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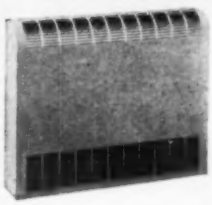

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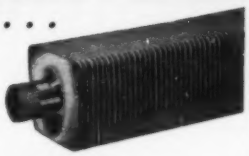

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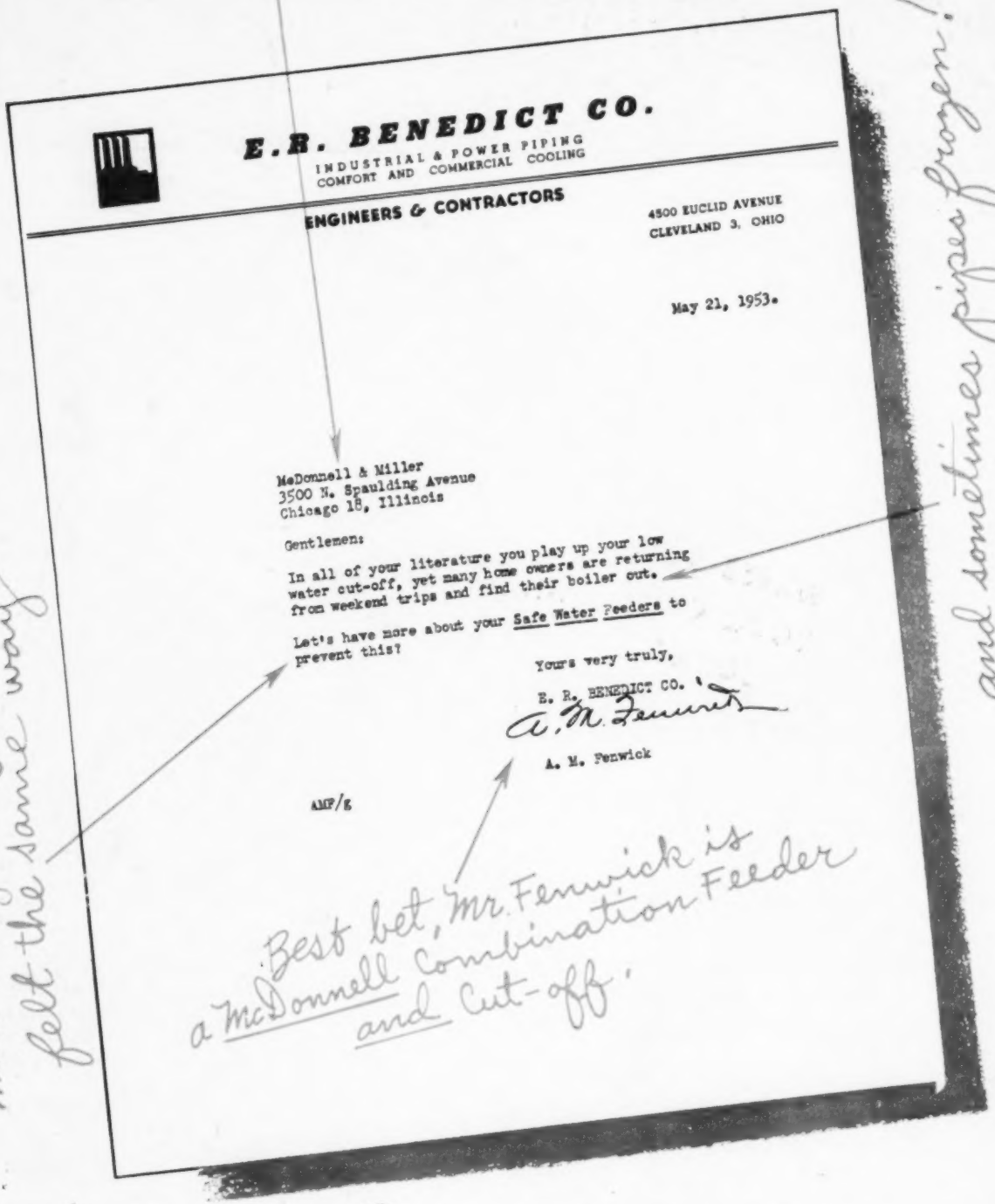

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